Aespire 7900

User's Reference Manual—Part 1

System Controls, Operation, Checkout

User Responsibility

This Product will perform in conformity with the description thereof contained in this User's Reference manual and accompanying labels and/or inserts, when assembled, operated, maintained, and repaired in accordance with the instructions provided. This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted, or contaminated should be replaced immediately. Should repair or replacement become necessary, Datex-Ohmeda recommends that a telephonic or written request for service advice be made to the nearest Datex-Ohmeda Customer Service Center. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Datex-Ohmeda and by Datex-Ohmeda trained personnel. The Product must not be altered without the prior written approval of Datex-Ohmeda. The user of this Product shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, improper repair, damage, or alteration by anyone other than Datex-Ohmeda.

⚠ **CAUTION** U.S. Federal law restricts this device to sale by or on the order of a licensed medical practitioner. Outside the U.S.A., check local laws for any restriction that may apply.

Datex-Ohmeda products have unit serial numbers with coded logic which indicates a product group code, the year of manufacture, and a sequential unit number for identification.

AAA F 12345

This alpha character indicates the year of product manufacture and when the serial number was assigned; "D" = 2000, "E" = 2001, "F" = 2002, etc. "I" and "O" are not used.

CE 0197

S/5 Aespire, Link-25, Disposable Multi Absorber, Reusable Multi Absorber, SmartVent, Tec 6 Plus, and ***Tec 7***are registered trademarks of Datex-Ohmeda Inc.

Other brand names or product names used in this manual are trademarks or registered trademarks of their respective holders.

Table of Contents

1 Introduction

What is an Aespire 7900? 1-2
Symbols used in the manual or on the equipment 1-3

2 System Controls and Menus

Anesthesia system controls 2-2
Breathing system components 2-5
ACGO 2-8
Scavenging the ACGO sample flow 2-9
Scavenging from the external manual breathing circuit 2-10
Vaporizer controls 2-10
Ventilator controls 2-12
Optional Features 2-12
Control panel 2-12
How to set controls 2-14
How to use the menu 2-15
Menu map 2-16
More about menu functions 2-17
How to change menu settings 2-18
Optional auxiliary O_2 flowmeter and suction regulators 2-19

3 Operation and Tutorial

Pre-use check list 3-3
Turn On the system 3-4
Set the alarm loudness 3-5
Show or hide alarm limits and units 3-7
Turn the volume alarms on or off 3-8
Set alarm limits 3-8
Set an audible alarm for circuit leaks 3-10
Set Cardiac Bypass 3-11

Start mechanical ventilation 3-13
Stop mechanical ventilation 3-14
Alarms 3-15
Alarm Tones 3-15
Alarm Silence 3-15
Alarm Suspend 3-15
Set the ventilation mode 3-16
Set ventilator controls 3-18
Optional features 3-18
Ventilator controls 3-18
Volume Control mode 3-19
Pressure Control mode 3-20
SIMV mode 3-20
PSVPro mode 3-20
Set inspiratory pause (volume modes) 3-22
Set SIMV and PSVPro controls 3-24
Silence alarms 3-26
Reading the pressure waveform (Paw) 3-27
Scales 3-27
Measure circuit compliance 3-30
Show the service settings 3-31
Measure circuit compliance 3-33

4 Preoperative Tests

Aespire 7900 Preoperative tests schedules 4-2
Test Intervals 4-2
Test devices 4-3
Inspect the System 4-4
Power failure alarm test 4-5
Minimize alarms (optional) 4-5
Pipeline and cylinder tests 4-6
Flow control tests 4-7
Vaporizer installation 4-9
Vaporizer back pressure test 4-10
Low-pressure leak test 4-11
Negative low-pressure leak test 4-11

ISO 5358 or BSI standard positive low-pressure leak test 4-13
Alarm tests 4-14
Breathing system tests 4-16
Monitor and ventilator tests 4-18

Index

Warranty

1 Introduction

In this section

What is an Aespire 7900? 1-2
Symbols used in the manual or on the equipment 1-3

What is an Aespire 7900?

The Aespire 7900 is a compact, integrated and intuitive anesthesia delivery system. The ventilator portion provides mechanical ventilation for patients during surgery as well as monitoring and displaying various patient parameters.

The system uses a microprocessor-controlled ventilator with internal monitors, electronic PEEP, Volume Mode, and other optional features. A serial interface permits communication to cardiovascular and respiratory gas monitoring.

Illustrations in this manual may not cover all types of options available. Other equipment may be attached to the system on the top shelf or on the side dovetail rails. Consult with your Datex-Ohmeda representative for details about systems available in your location.

The Aespire 7900 is not suitable for use in an MRI environment.

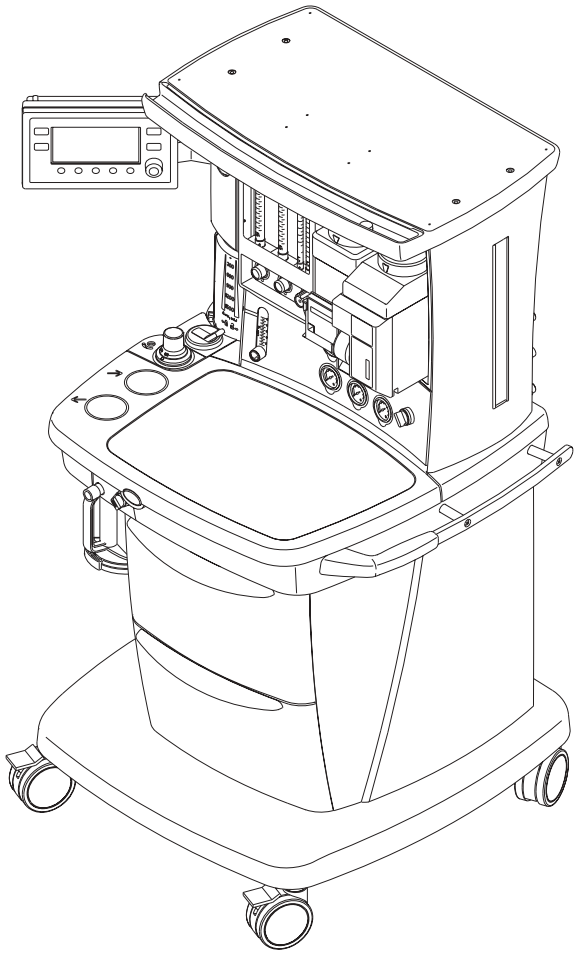


Figure 1-1 ▪ Aespire 7900 example

Symbols used in the manual or on the equipment

⚠ **WARNINGS** and ⚠ **CAUTIONS** tell you about dangerous conditions that can occur if you do not follow all instructions in this manual. Read and follow all warnings and cautions.

WARNINGS tell about a condition that can cause injury to the operator or the patient.

CAUTIONS tell about a condition that can cause damage to the equipment.

A **Note** provides additional information to clarify a statement in text.

An **Important** statement is similar to a Note, but provides a comment of greater emphasis.

Other symbols replace words on the equipment or in Datex-Ohmeda manuals. No one device or manual uses all of the symbols. These symbols include:

On (power)	Not autoclavable
Off (power)	Type B equipment
Standby	Type BF equipment
Standby or preparatory state for part of the equipment	Type CF equipment
"ON" only for part of the equipment	Caution, ISO 7000-0434
"OFF" only for part of the equipment	Attention, refer to product instructions, IEC 601-1.
Direct current	This way is up.
Alternating current	Dangerous Voltage
Protective earth ground	Input
Earth ground	Output
Frame or chassis ground	**REF** Stock Number
Alarm silence button	**SN** Serial Number
Equipotential	Bag position/ manual ventilation
Variability	Read top of float
Variability in steps	Vacuum inlet

+ Plus, positive polarity

- Minus, negative polarity

Lamp, lighting, illumination

Movement in one direction

Movement in two directions

Lock

Unlock

134°C Autoclavable

u Open drain (remove liquid)

q Inspiratory flow

t O_2 sensor connection

Volume alarms On/Off touch key

Suction bottle outlet

O_2+ O_2 Flush button

Cylinder

Isolation transformer

Low pressure leak test

r Mechanical ventilation

U Close drain

Q Expiratory flow

Alarm silence touch key

Menu touch key

Alarm silence touch key (Tec 6)

End case touch key

CE XXXX Systems with this mark agree with the European Council Directive (93/42/EEC) for Medical Devices when they are used as specified in their Operation and Maintenance Manuals. The xxxx is the certification number of the Notified Body used by Datex-Ohmeda's Quality Systems.

EC REP CE European Union Representative

2 System Controls and Menus

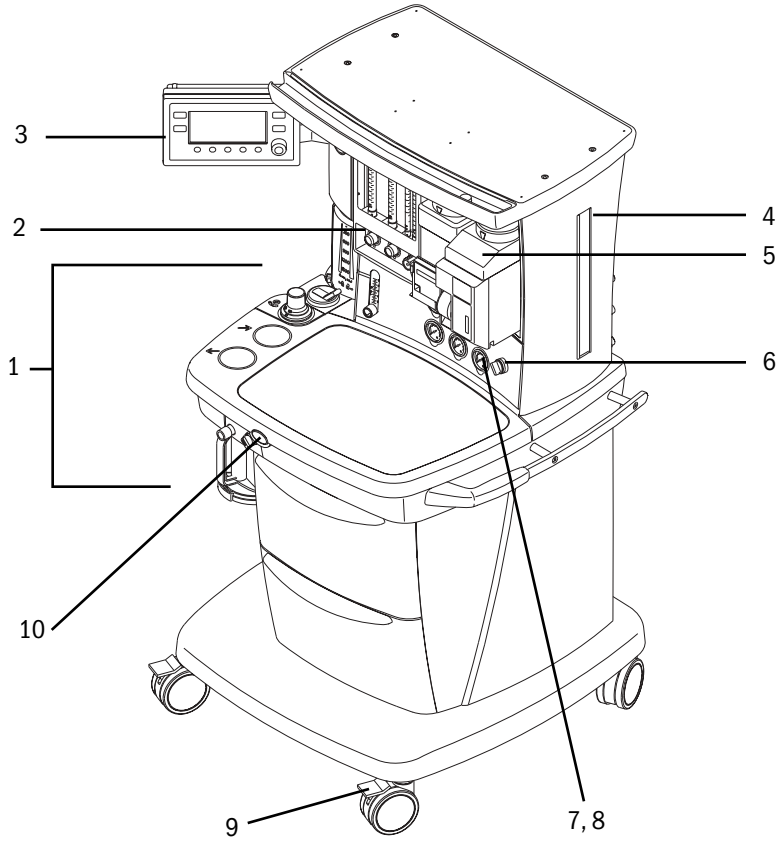
In this section

Anesthesia system controls 2-2
Breathing system components 2-5
Vaporizer controls 2-10
Ventilator controls 2-12
Optional auxiliary O_2 flowmeter and suction regulators 2-19

Anesthesia system controls

⚠WARNING Explosion Hazard. Do not use S/5 Aespire systems with flammable anesthetic agents.

⚠WARNING Do not use antistatic breathing tubes or masks. They can cause burns if you use them near high frequency surgical equipment.

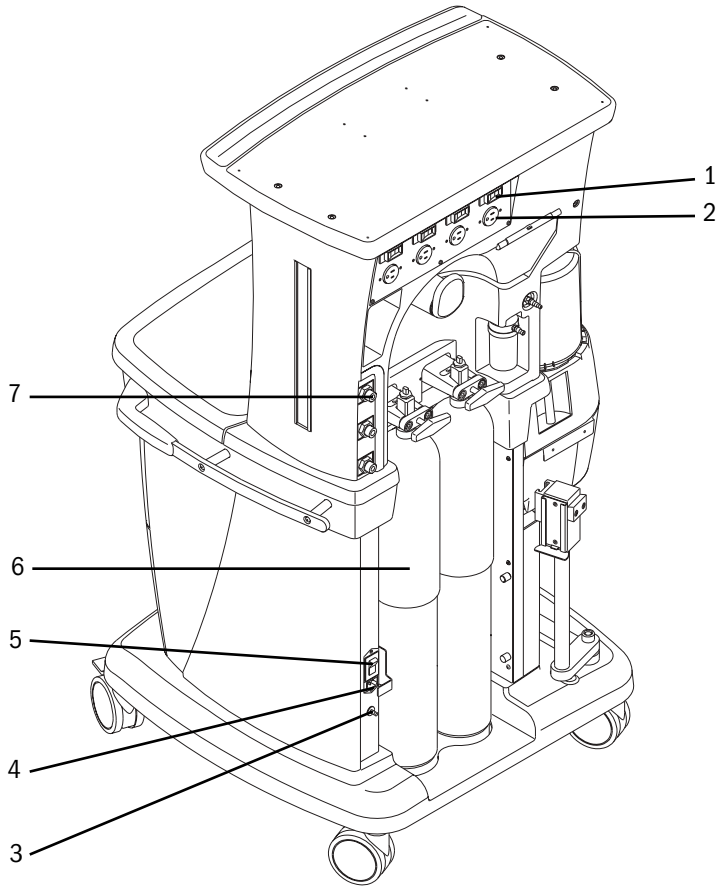


1. Breathing system
2. Flow controls
3. Ventilator / monitoring display
4. Dovetail rails
5. Vaporizer
6. System switch
7. Pipeline pressure gauge(s) (upper row)
8. Cylinder pressure gauge(s) (lower row)
9. Brake
10. O_2 flush button

Figure 2-1 ▪ Aespire (front view)

Figure 2-1 shows these controls on the front of the S/5 Aespire.

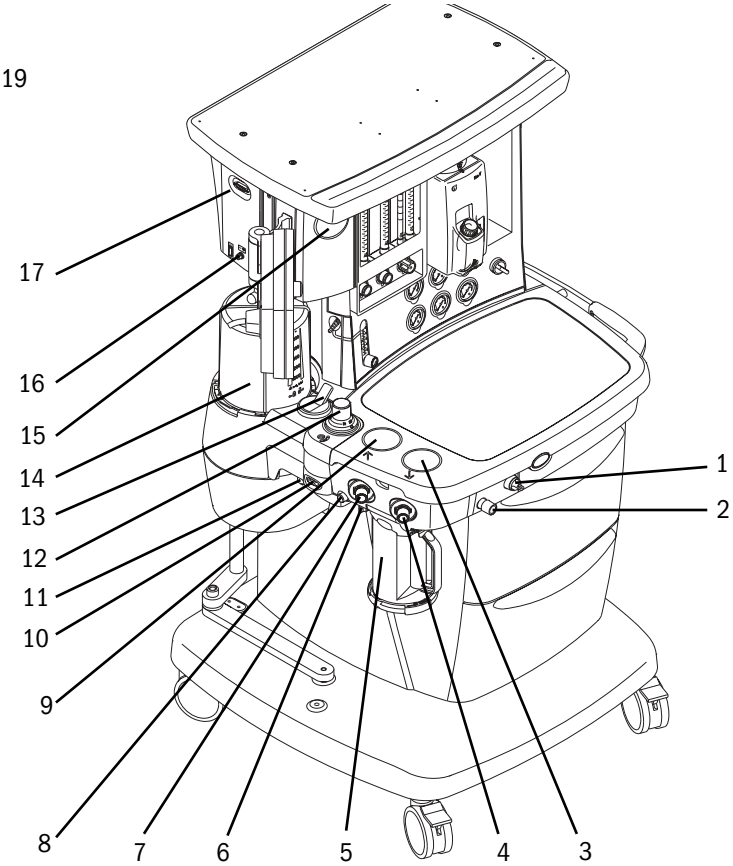
Item		Description
2	Flow controls	Turn the control counterclockwise to increase the flow and clockwise to decrease. The system switch must be On for gas to flow.
7	System switch	Set the switch to the on (|) position to permit gas flow and to turn on the system.
9	Brake	Push down to lock. Lift to release.
10	O_2 flush button	Push the O_2 flush button to supply high flows of O_2 to the breathing system.



1. Circuit Breaker for Electrical Outlet
2. Electrical Outlet (optional)
3. Equipotential Stud
4. Mains Inlet
5. System Circuit Breaker
6. Cylinder(s) (optional)
7. Pipeline Connection(s)

Figure 2-2 • Aespire rear view

Breathing system components

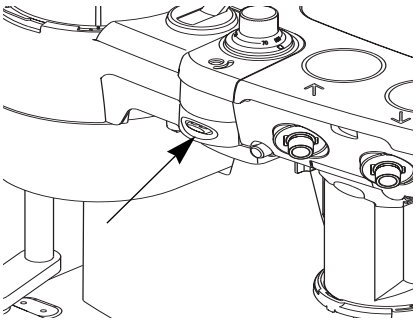
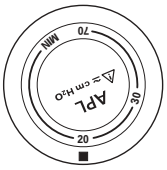


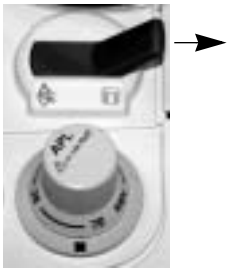
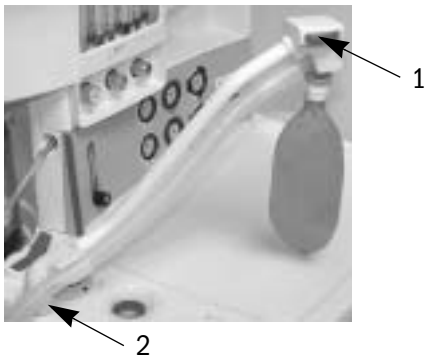
1. Auxiliary common gas outlet (ACGO) switch
2. ACGO
3. Inspiratory check valve (unidirectional valve)
4. Inspiratory flow sensor / patient connection (circuit connections)
5. Canister (carbon dioxide absorbent)
6. Canister release
7. Expiratory flow sensor / patient connection (circuit connections)
8. Leak test plug
9. Expiratory check valve (unidirectional valve)
10. Breathing system release
11. Manual bag port
12. APL (adjustable pressure-limiting) valve
13. Bag/mechanical ventilation switch
14. Bellows assembly (mechanical ventilation)
15. Pressure gauge (airway)
16. Sample gas return port
17. Serial port
18. Manual Bag (optional; no bag arm)
19. Bag arm (optional)

Figure 2-3 • Breathing system parts

Figure 2-3 shows these controls on the front of the S/5 Aespire.

Item		Description
1	Auxiliary Common Gas Outlet switch (ACGO)	Sends fresh gas to the ACGO when the switch is activated. The ACGO may be used to provide fresh gas to an external manual breathing circuit. Mechanical ventilation is not available when the auxiliary outlet is selected and a medium priority alarm will sound and a message “Aux Gas Outlet On” is displayed. Pressure and volume monitoring are not available when the ACGO is selected. Fresh gas oxygen monitoring is available when the ACGO is selected. The ACGO should not be used to drive external ventilators or for jet ventilation. Breathing system selected: Auxiliary outlet selected:
4 & 7	Flow sensor	Flow sensors provide volume measurements for some monitoring functions. All systems have flow sensors in both positions of the flow sensor module.

Item		Description
6	Canister release	Push to remove the canister. This allows the breathing system to vent to the room. Be sure to hold the canister by the handle before releasing the canister. Note: Always do a leak test after operating the canister release. 
12	APL valve	Adjusts breathing system pressure limit during manual ventilation. The scale shows approximate pressures. Above 30 cm H_2O, you will feel clicks as the knob turns. Turn clockwise to increase. The following example setting is at about 20 cm H_2O: 

Item		Description
13	Bag / Mechanical Ventilation switch	Selects between manual ventilation (bag) or mechanical ventilation (ventilator). Mechanical ventilation Off (gas to bag): Mechanical ventilation On (gas to bellows): 
17	Bag arm (optional)	Squeeze at (1) to raise or lower the arm. The Bag arm rotates at (2). 

ACGO

When you operate a breathing apparatus with fresh gas from the ACGO:

- Mechanical ventilation is not available.
- The pressure gauge, Bag/Vent switch, APL valve, and bag arm are not part of the external circuit.
- Volume and pressure monitoring are not available.
- O_2 monitoring of fresh gas is available automatically when the ACGO is selected if the system has the O_2 monitoring option.

- Fresh gas oxygen concentration is displayed on the ventilation screen. Set alarm limits appropriately. Note that fresh gas oxygen concentration may not reflect FiO_2 in rebreathing circuits such as the Mapleson series. Use an external O_2 monitor if using a rebreathing circuit on ACGO.
- A sample of the fresh gas is diverted to the O_2 cell in the breathing system.
- The sample flow to the O_2 sensor is dependent on the pressure in the external circuit. The sample flow reduces the fresh gas flowrate to the external breathing circuit as shown in the graph.
- Do not use an external ventilator on the ACGO.
- Do not use the ACGO to drive external ventilators or for jet ventilation.

Estimate the mean pressure required for ventilation and determine a mean sample flow rate from the graph:

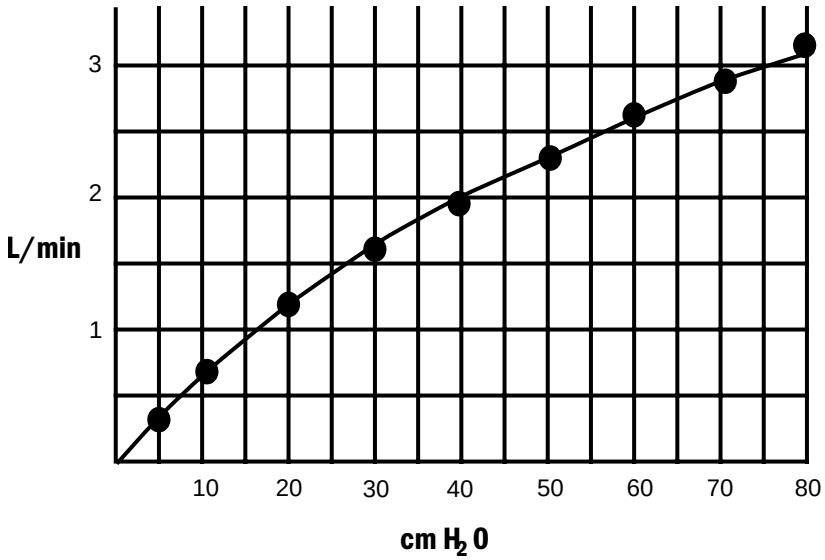


Figure 2-4 • Back pressure (cm H_20) vs. flow to O_2 sensor (L/min)

Scavenging the ACGO sample flow

If the external manual breathing circuit is to be used with N_2O or volatile anesthetics, the sample flow should be scavenged.

1. Occlude the patient circuit of the breathing system by using the leak test plug located to the rear of the expiratory port.
2. Check for clinically correct settings. Set the Bag to Vent switch to the ventilator mode. Alternatively set the Bag to Vent switch to the bag mode and set the APL to MIN and attach a bag.
3. The bellows, or bag, will fill slowly with the fresh gas sample flow and then spill to the AGSS.

Scavenging from the external manual breathing circuit

If the external manual breathing circuit is to be used with N_2O or volatile anesthetics, the exhaust should be scavenged.

An auxiliary inlet is available for active AGSS units. It provides a 30 mm male connection into the auxiliary port under the breathing system.

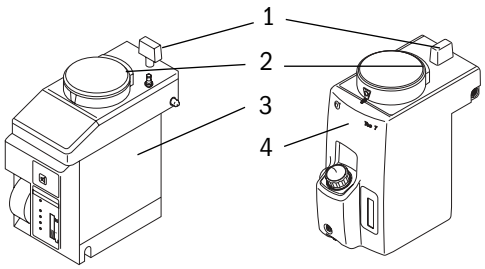
- The auxiliary inlet is a convenience inlet to the air brake of active AGSS units. There is a reservoir to capture exhaust flows higher than the extract flow.

For all AGSS, a separate exhaust hose is necessary from the external manual circuit to the disposal point.

Vaporizer controls

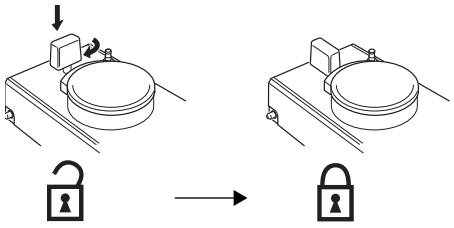
Refer to the description in this section and the vaporizer operation and maintenance manual for more detailed information on the vaporizer.

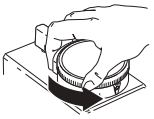
Figure 2-5 shows the vaporizer controls.



1. Lock Lever
2. Concentration Control and Release
3. Tec 6 Plus
4. Tec 7

Figure 2-5 ▪ Vaporizer controls

Item		Description
1	Lock lever	Turn the lever fully clockwise to lock the vaporizer in position. 

Item		Description
2	Concentration control and release	Push the release and turn the concentration control to set the agent concentration. The Tec 6 Plus concentration control does not turn as long as the warm-up indicator is on. 

Ventilator controls

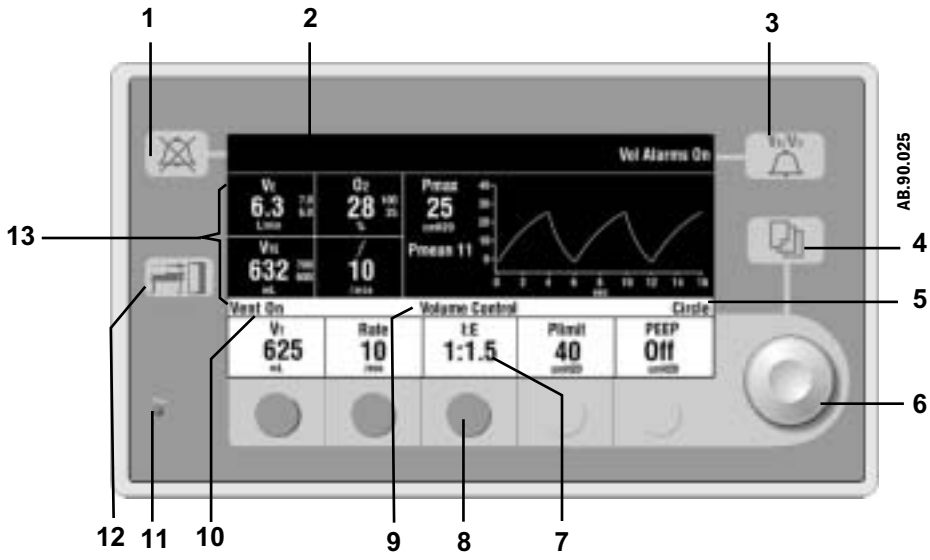
Optional Features

The Aespire 7900 can be equipped with several optional ventilation functions. References made in this manual to SIMV and PSVPro modes, are only applicable to systems equipped with these functions.

Control panel

Ventilator controls include:

- Touch keys
- Menu screens
- A control knob

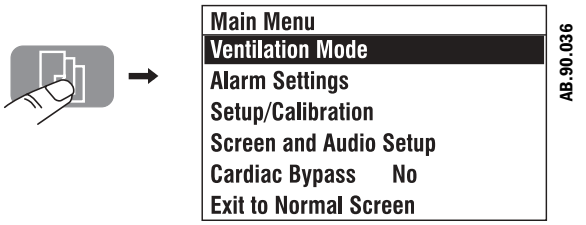
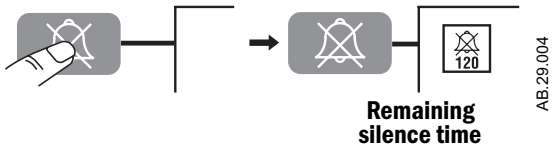
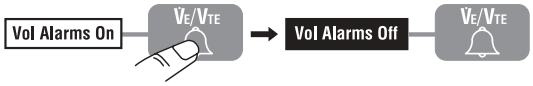
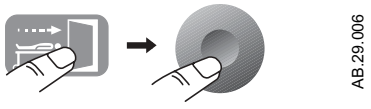


1.Alarm silence (key)
2.Alarm message (display)
3.Volume alarms On/Off (key)
4.Menu key
5.Breathing circuit module (display)
6.Control knob
7.Control setting
8.Selection key
9.Ventilation mode (display)
10.Ventilator status (On or Off)
11.Mains indicator
12.End Case (key)
13.Measured values

Figure 2-6 • SmartVent controls and monitored data

All but two of the controls for the ventilator are located on the Ventilation/ Monitoring display. The two controls are:

- The system switch, which powers the ventilator.
- The Bag/Vent switch, which starts and stops mechanical ventilation.

Item	Description
Menu key	Shows the main menu. 
Alarm silence key and indicator	Silences most alarms for 120 seconds. Pushing the key when no alarm is active pre-silences low and medium priority alarms, except Minimum Monitoring, for 90 seconds. The "No O_2 Pressure" alarm cannot be silenced. 
Volume alarm key and status	Turns volume alarms on and off. 
End Case key	End Case helps to prevent false alarms when no patient is connected. It: • Puts the apnea and volume alarms into Standby. • Returns user selections to the most common settings: Cardiac bypass off; Alarm limits shown. • Sets the PEEP to 0 cmH_2O (default value). • Sets Plimit to one of two values: facility default or 40 cmH_2O. • Forces the circuit Leak Audio to On. Mechanical ventilation must be off (set the Bag/Vent switch to Bag or select the auxiliary common gas outlet). 

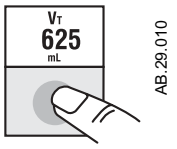
How to set controls

The bottom of the screen shows control settings.

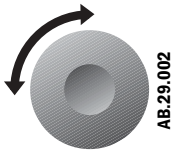
Notes:

- The ventilator will not allow the setting of values it cannot supply. A reject tone will sound or a message will appear on the screen.
- If the incorrect key is pushed, wait ten seconds or push the correct key.
- If the new setting is not saved, the ventilator continues to use the old setting.

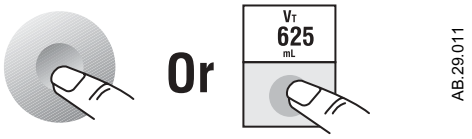
Step 1
Push the selection key below the setting.



Step 2
Turn the knob to change the setting.



Step 3
Push the knob or the key to save the change.



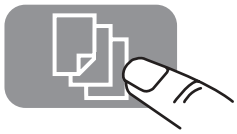
How to use the menu

Screens go back to the normal display 25 seconds after the last action.

During a calibration or other procedure, the screen shows the instructions.

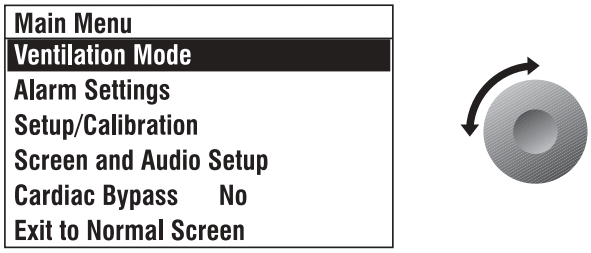
Step 1
Push the Menu key to see the main menu.

AB29.013



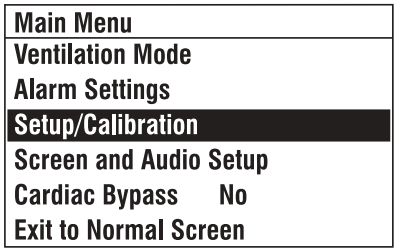
Step 2
Turn the knob to select an option (highlight).

AB.90.036

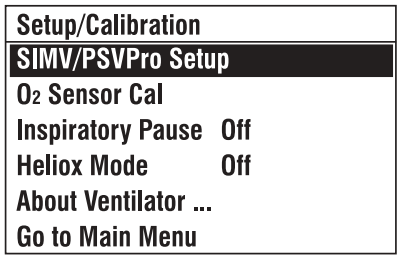


Step 3
Push the knob to show the next screen.

AB90.037

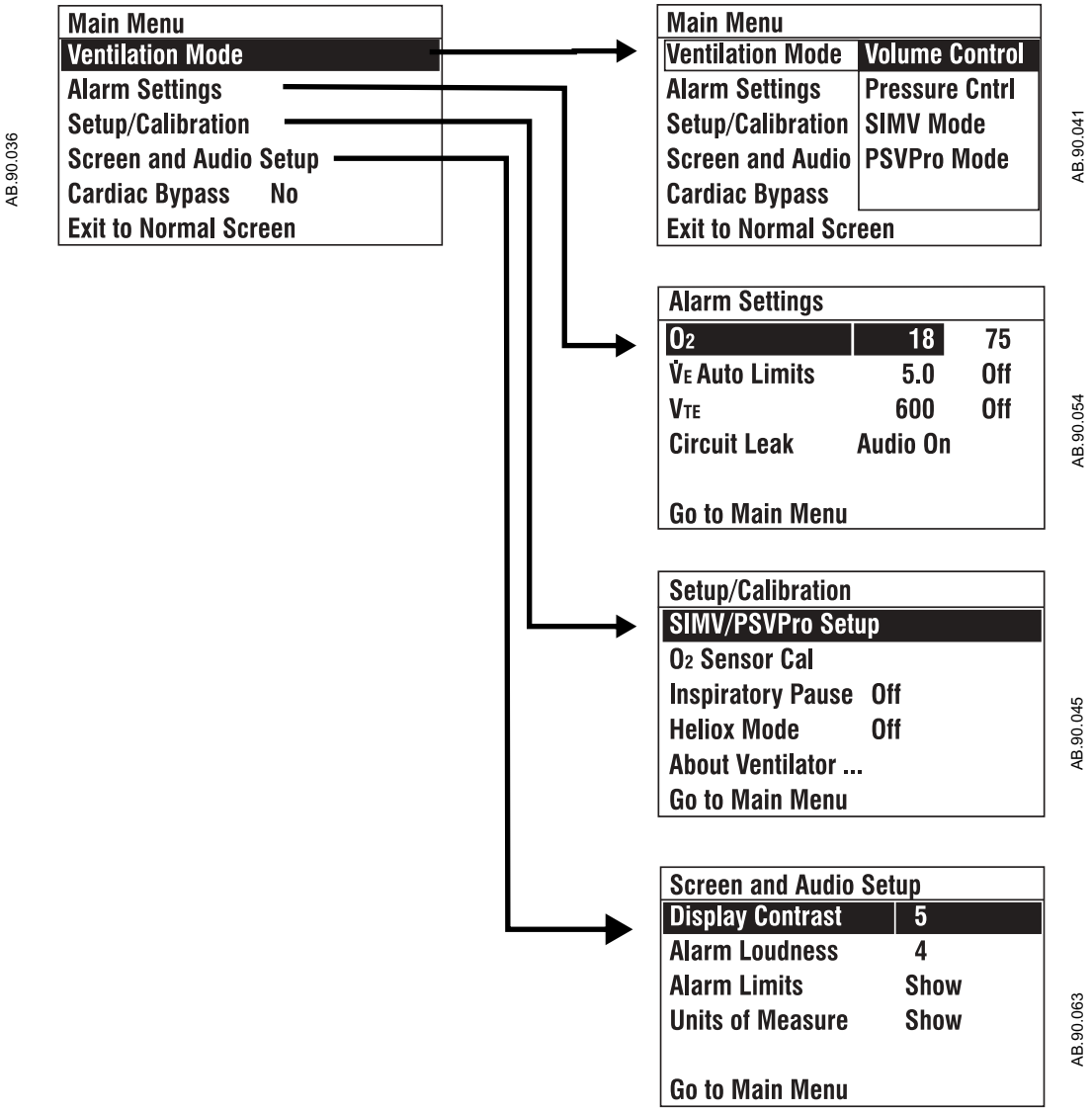


AB.90.045



Menu map

Figure 2-6 shows the menu map. The table tells you about some of the options.



Note: If the Alarm Settings page shows V_E Auto Limits On during mechanical ventilation, the system automatically calculates alarm limits.

Figure 2-7 • Menu map

More about menu functions

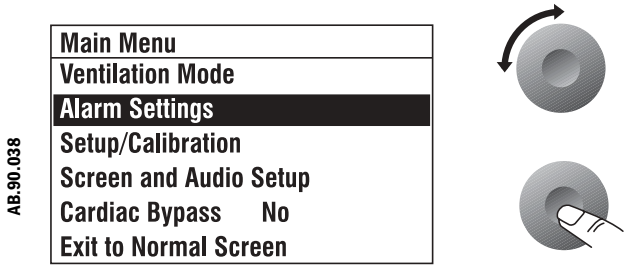
Menu	Option	Function
Main	Cardiac Bypass (In Progress/No)	Turns off volume and apnea alarms when these are not appropriate (e.g., during heart lung bypass).
Alarm Settings	Circuit Leak (Audio On/Off)	Turns off the alarm tone for circuit leaks. You must set the low $\dot{V}_E$ alarm first. Select 'Audio off' if the circuit has a known leak (e.g., an uncuffed endotracheal tube).
Setup/ Calibration	SIMV/PSVPro Setup	Shows additional ventilation settings for SIMV and PSVPro modes.
	O_2 Sensor Cal	Shows menu for O_2 sensor calibration.
	Inspiratory Pause	Adds an inspiratory pause time to volume control breaths.
	Heliox mode (On/Off)	Tells the ventilator if heliox is in use.
	About Ventilator...	Shows service level settings: software version; if facility defaults or the control settings from the previous case are used when the system is first turned on; altitude; and drive gas (O_2 or Air).
Screen and Audio	Alarm Limits (Show/Hide)	*'Show'* displays alarm limits next to the data on the screen. **Show Limits** **Hide Limits**
	Units of Measure (Show/Hide)	*'Show'* displays units under the data on the screen. **Show Units** **Hide Units**

How to change menu settings

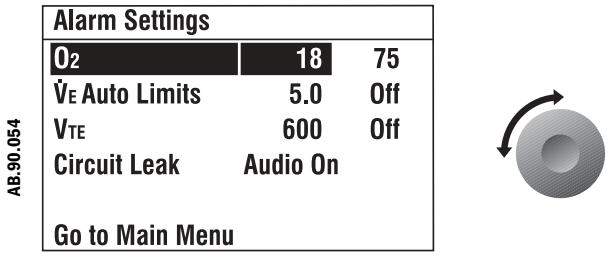
This example changes alarm limits.

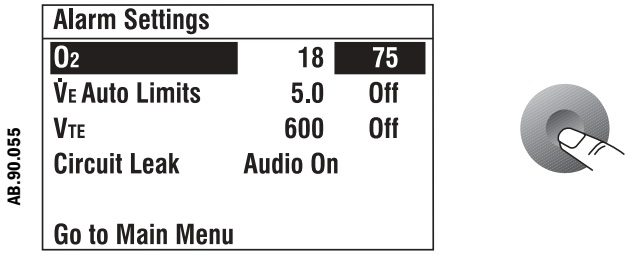
The screen goes back to the normal display 25 seconds after the last action.

Step 1
Select the desired menu.

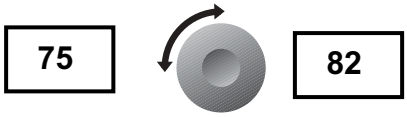


Step 2
Turn, then push the knob to select an option.





Step 3
Turn the knob to change the setting.

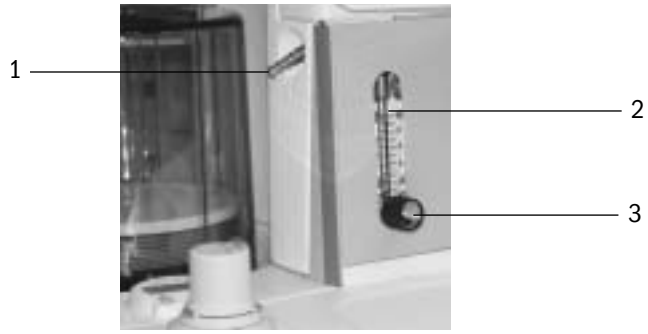


Step 4
Push the knob to save the change.

Optional auxiliary O_2 flowmeter and suction regulators

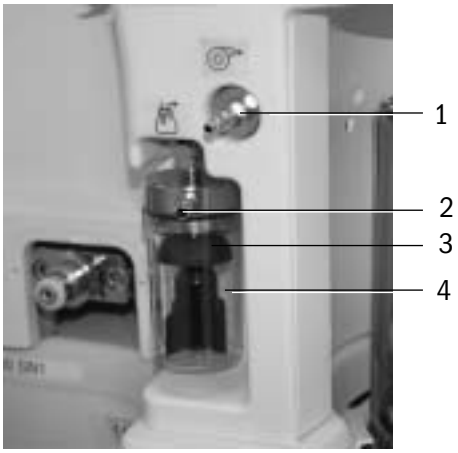
These options are available:

- Auxiliary O_2 flowmeter
- A continuous suction regulator or a venturi suction regulator



1. Auxiliary O_2 Flowmeter outlet
2. Auxiliary O_2 Flowmeter
3. Auxiliary O_2 flow control

Figure 2-8 • Optional Auxiliary O_2 Flowmeter and control



1. External vacuum (non-venturi)
2. Collection bottle connection
3. Filter
4. Overflow safety trap

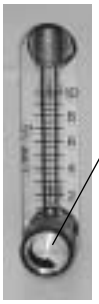
Figure 2-9 • Optional Suction Regulator

Suction regulator controls

Mode switch:
MAX: for maximum suction, set the switch to **MAX**.
On (**|**): for adjustable suction, set the switch to on (**|**) or **|**.
Off (**0**): to turn off suction, set the switch to **0**.
With the mode switch set to "**|**", turn the control clockwise to increase suction and counterclockwise to decrease it.

Auxiliary flowmeter control

The auxiliary flowmeter is not pressure compensated.



Turn the control counterclockwise to increase the O_2 flow and clockwise to decrease.

3 Operation and Tutorial

⚠WARNING In addition to volume apnea and low airway pressure alarms, other ventilator alarms are included to indicate potential hazard conditions. All alarms that occur should be investigated to help ensure adequate patient safety.

⚠ Desiccated (dehydrated) absorbent material may produce dangerous reactions when exposed to inhalation anesthetics.

⚠ For systems with dual absorbent canisters, the carbon dioxide absorbent material in both canisters shall be changed at least weekly, preferably every Monday morning. For single canister systems the absorbent material shall be changed every day, preferably at the start of the day.

⚠ Carbon dioxide absorbent material shall be changed whenever users cannot assure the degree of hydration of the absorbent. Such conditions may include finding a machine with fresh gas that has been flowing for an unknown period of time, or using a machine that is used infrequently.

⚠ All fresh gas flows shall be terminated when the machine is NOT in use. (User manuals describe how to achieve null flows).

⚠ Users are advised to consider the use of low-flow techniques when the machine is in use and whenever clinically appropriate to maintain hydration of the absorbent material.

In this section

This section describes specific tasks. Use it as a step-by-step guide or a training tool.

Turn on the system 3-4
Set the alarm loudness 3-5
Show or hide alarm limits and units 3-7
Turn the Volume Alarms on or off 3-8
Set alarm limits 3-8
Set an audible alarm for circuit leaks 3-10
Set Cardiac Bypass 3-11
Start mechanical ventilation 3-13
Stop mechanical ventilation 3-14
Alarms 3-15
Set the ventilation mode 3-16
Set ventilator controls 3-18
Set SIMV and PSVPro controls 3-24
Silence alarms 3-26
Reading the pressure waveform (Paw) 3-27
Measure circuit compliance 3-30
Show the service settings 3-31
Measure circuit compliance 3-33

Pre-use check list

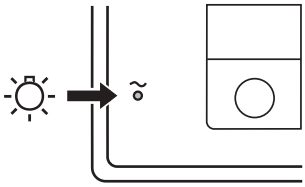
Connect the power cord to a wall outlet.

Prior to each case check all the ventilator settings to ensure they are appropriate for the patient.

1. Check that the mains electrical indicator is lighted.
2. Turn on the anesthesia system power switch. (If system power is already ON, cycle the power switch OFF, then back ON to allow the system power-up self test to run.)
3. Unplug the system power cord from mains power.
4. Ensure the ventilator functions and indicates the use of battery backup power.
5. Reconnect the system power cord to the system mains power.
6. Select the desired mode of ventilation.
7. Select the desired breathing circuit and ensure it is displayed to the right of the selected ventilation mode above the pressure wave form.
8. Set the fresh gas flow.
9. Set V_T, to the appropriate tidal volume value or Pinspired to the appropriate level.
10. Set the breathing Rate.
11. Set I:E Ratio.
12. Set Plimit (Airway pressure limit).
13. Set PEEP.
14. Check and adjust alarm settings to ensure they are appropriate for the ventilator settings and the case at hand.
15. Run the 21% Oxygen Sensor Calibration Check.

Turn On the system

Step 1
Connect the power cord to a wall outlet. The mains indicator comes on when AC Power is connected.

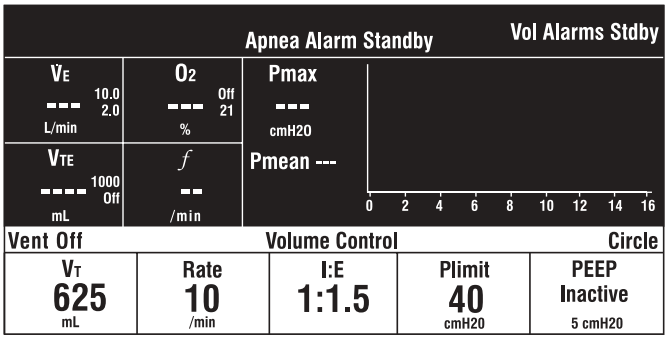


Step 2
Set the system switch to On (|).

Step 3
The display shows the power-up screen, and the system does a series of self tests.

Datex-Ohmeda
Aespire® 7900 SmartVent™
Software Version: 4.6 ©2004 Datex-Ohmeda, Inc.
Settings are from last case.
Always do the preoperative test before you use this system.
▲ Refer to the operation manual.
Powerup Self Tests OK

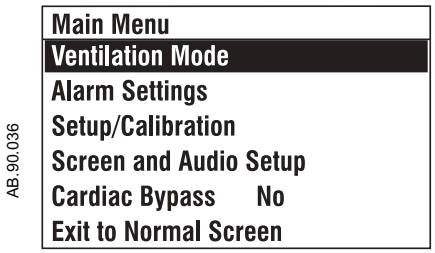
Step 4
When the self tests pass, the display shows the normal screen.
If a test fails, the screen shows an alarm. Refer to the troubleshooting section.

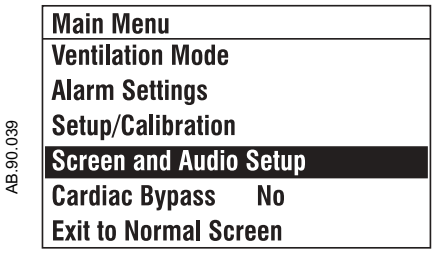


Set the alarm loudness

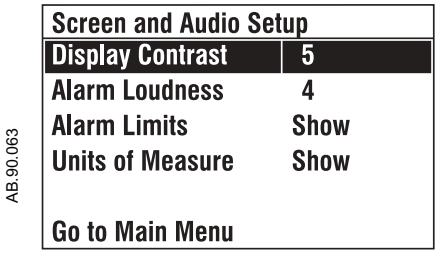
Step 1
Select the Screen and Audio Setup menu.

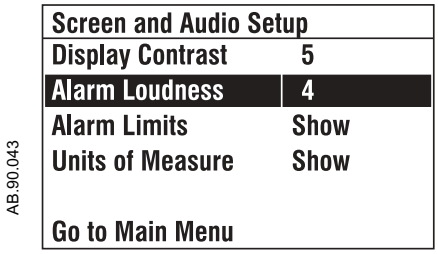
- Push the menu key.
- Turn, then push the knob to select Screen and Audio.





Step 2
Turn, then push the knob to select alarm loudness.





Step 3

Turn, then push the knob to adjust the volume.

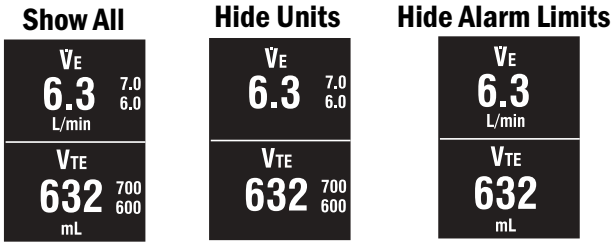
- The volume range is 1 to 5 (loudest).
- As the volume is changed, the system sounds test tones.
- Push the knob to save the change.

Show or hide alarm limits and units

To simplify the displays, hide alarm limits and units of measurement. If the alarm limits are hidden, the screen automatically shows the limits when:

- An alarm occurs.
- Volume alarms are off or the auxiliary common gas outlet is selected (monitoring off).
- An individual alarm limit is set to Off.

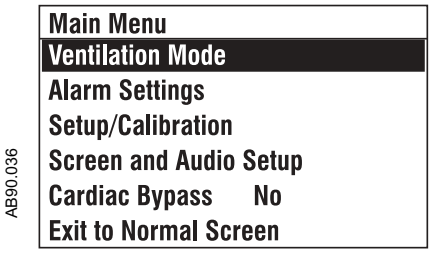
When the system is set to Standby, alarm limits go back to Show.

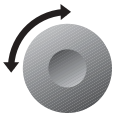


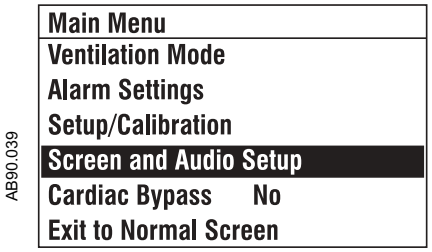
Step 1

Select the Screen and Audio Setup menu.

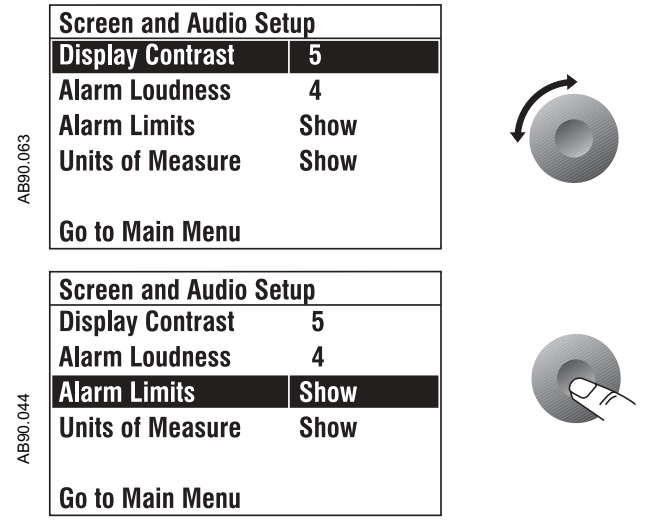
- Push the menu key.
- Turn, then push the knob to select Screen and Audio Setup.



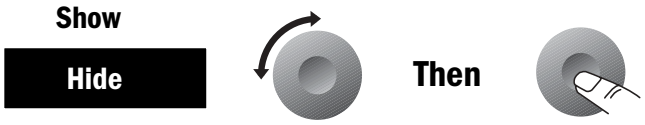




Step 2
Turn, then push the knob to select Alarm Limits or Units of Measure.



Step 3
Turn, then push the knob to select Show or Hide. Push the knob to save the change.

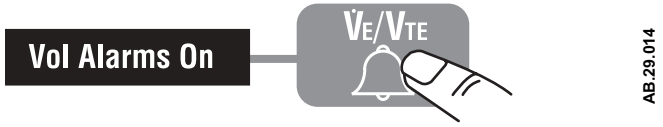


Turn the volume alarms on or off

⚠ **WARNING** Do not turn volume alarms off with a spontaneously breathing patient, the system will not alarm for low volume.

The volume alarm key ($\dot{V}_E/V_{TE}$) turns volume alarms on and off. When the alarms are off, a large X covers the limits.

Use this control to prevent false alarms if you switch to manual ventilation at lower tidal volumes.



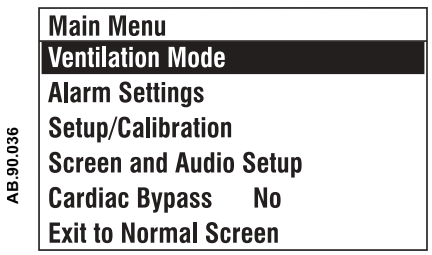
Use the End Case key (on control panel) to prevent apnea alarms between patients.

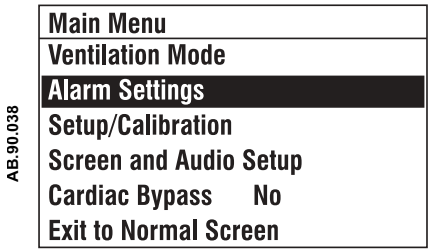
Set alarm limits

Note: If the Alarm Settings page shows $\dot{V}_E$ Auto Limits during mechanical ventilation, the system is set to automatically calculate $\dot{V}_E$ limits.

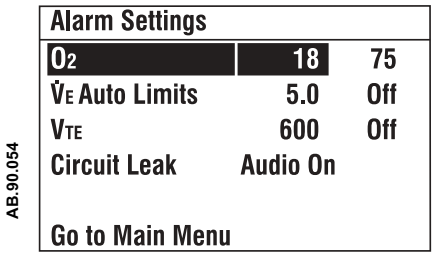
Step 1
Select the Alarm Settings menu.

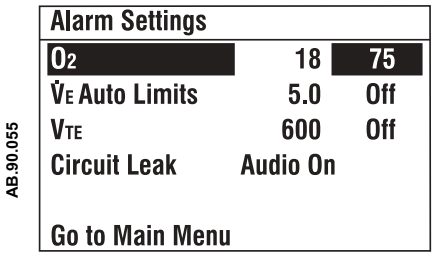
- Push the menu key.
- Turn, then push the knob to select Alarm Settings.





Step 2
Turn, then push the knob to select a limit.





Step 3
Turn, then push the knob to change the limit.

- Push the knob to save the change.
- The screen returns to the normal display 25 seconds after the last change.

Set an audible alarm for circuit leaks

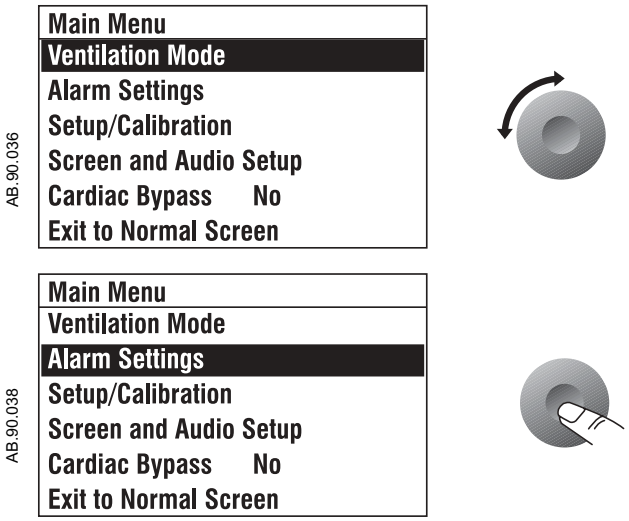
The patient circuit leak alarm is activated if less than half of the inspired volume returns through the expiratory flow sensor during mechanical ventilation. To prevent nuisance alarms from a known leak (e.g., an un-cuffed endotracheal tube), set the audio to Off. Normal volume and apnea monitoring does not change.

Note: This alarm is the first stage in detecting a circuit disconnect. The audible leak alarm cannot be turned off unless volume alarms are on, and the low $\dot{V}_E$ limit is set to a value other than off.

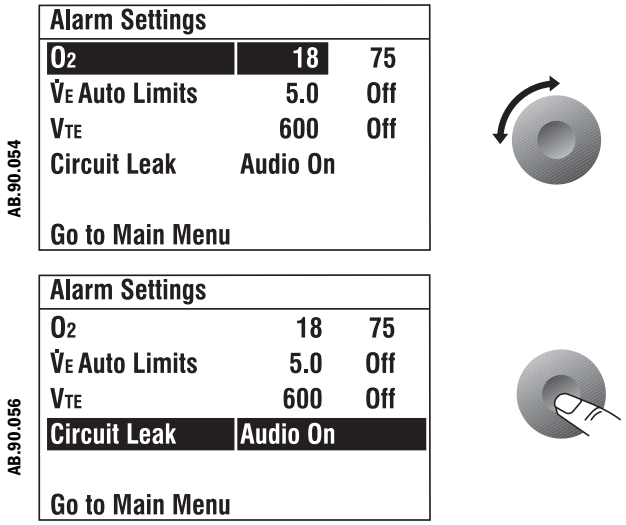
Step 1

Select the Alarm Settings menu.

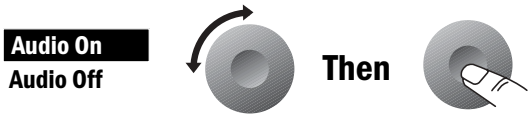
- Push the menu key.
- Turn, then push the knob to select Alarm Settings.



Step 2
Turn, then push the knob to select circuit leak audio.



Step 3
Turn, then push the knob to change the setting. You must push the knob to save the change.



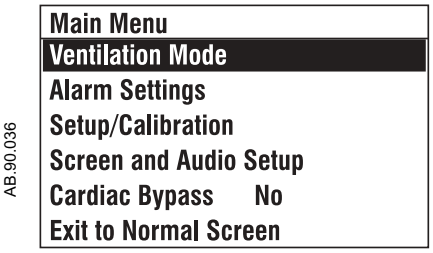
Set Cardiac Bypass

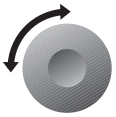
Set Cardiac Bypass to In Progress to prevent volume and apnea alarms when the patient is on cardio-pulmonary bypass.

When Cardiac Bypass In Progress is selected, the display shows:

- Cardiac Bypass
- Apnea Alarm Off
- Vol Alarms Off

Note: The mechanical ventilation must be off. When the mechanical ventilation is turned back on, Cardiac Bypass returns to the No Bypass setting and alarms become active.

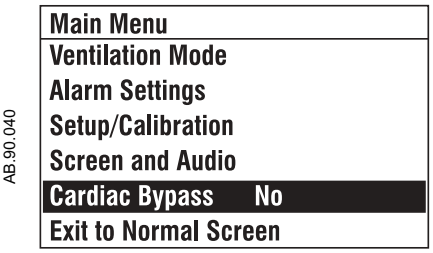


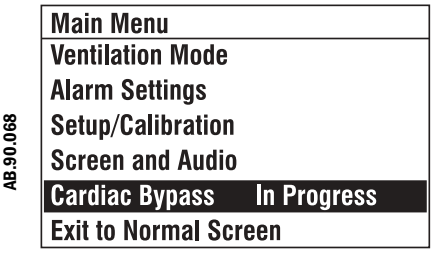


Step 1

Select the Cardiac Bypass menu item:

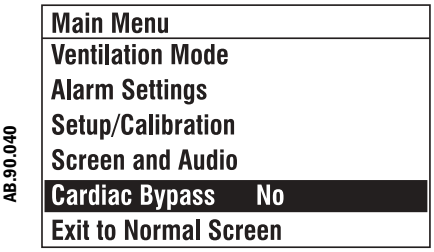
- Push the menu key.
- Turn, then push the knob to select Cardiac Bypass In Progress.





Step 2

Push the knob again to return to No.



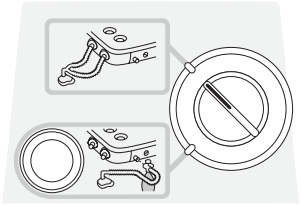
Start mechanical ventilation

⚠WARNING Make sure the patient circuit is correctly assembled and the control settings are correct before you start ventilation.

This example assumes the system is on and in manual ventilation (bag) mode.

Step 1
Make sure the control settings are clinically appropriate.

Step 2
Set the ACGO switch to the circle system position.

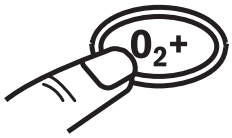


Step 3
Set the Bag/Vent switch to the Vent position.

- This selects mechanical ventilation (Vent).
- If mechanical ventilation is not available, a message tells you what to do. For example:

  "To start mech vent set the Bag/ Vent switch to Bag and back to Vent."

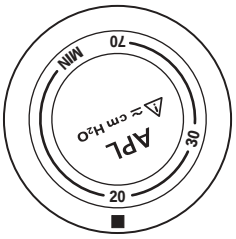
Step 4
If necessary, inflate the bellows using the O_2 flush button.



Stop mechanical ventilation

Step 1
Make sure a manual circuit is set up and the APL valve setting is OK before stopping mechanical ventilation.

This valve adjusts the breathing system pressure limit during manual ventilation. The scale shows approximate pressures. Above 30 cm H_2O, you will feel clicks as the knob turns.



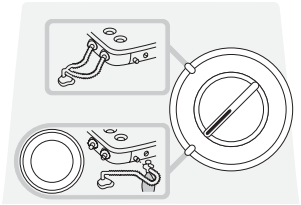
(Setting is at about 20 cm H_2O)

Step 2
Set the Bag/Vent switch to Bag position.

- This selects manual ventilation (bag) and stops the mechanical ventilation (ventilator).

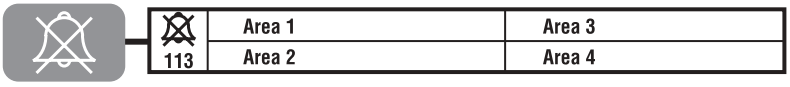
Or:

Select the ACGO and mechanical ventilation will stop.



Alarms

Alarms appear at the top of the screen. The highest priority alarm is shown in Area 1, the next highest priority alarm in area 2. If all areas are used, the lowest priority alarms cycle in area 4.



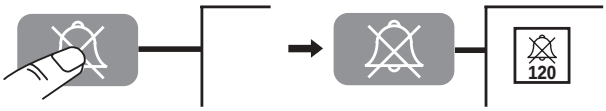
Alarm Tones

Alarm tones tell you about the alarm priority:

- High Priority: 2 bursts of 5 tones, every 10 seconds, (repeat)...
- Medium Priority: 3 tones every 25 seconds, (repeat)....
- Informational: single tone.

Alarm Silence

- The screen shows the time remaining in the silence period.
- If you push the alarm silence key while an alarm is silenced, countdown time resets to 120 seconds:



- High priority alarms always cause an audible tone and must be silenced individually.

Alarm Suspend

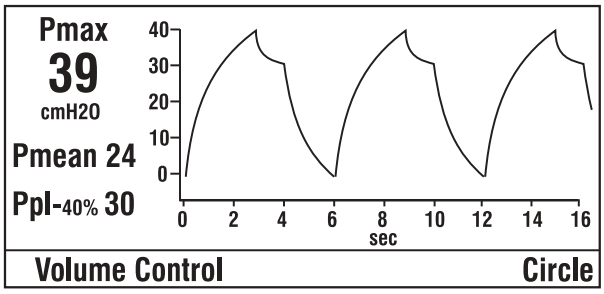
Pressing and holding the alarm silence key for one second, when no alarms are active, suspends audio tones for medium and low priority alarms for 90 seconds.

Refer to Part 2 of this manual for more information about alarms and messages.

Set the ventilation mode

Text below the waveform shows the ventilation mode:

- Pressure controlled modes supply a set pressure during inspiration.
- Volume controlled modes supply a set tidal volume.

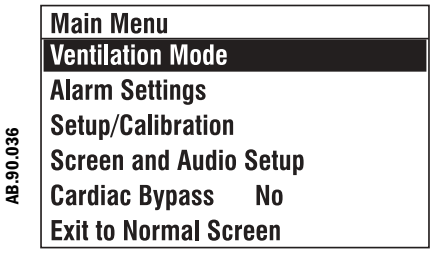


AB.90.092

Step 1
Select the Ventilation Mode.

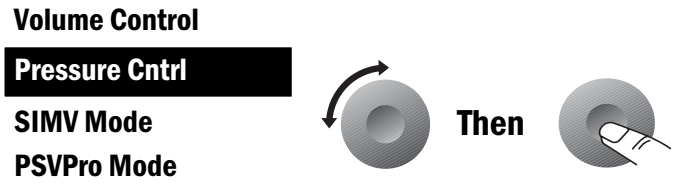
- Push the menu key.
- Push the knob to select **Ventilation** Mode.

AB.29.013



AB.90.036

Step 2
Turn, then push the knob to change the mode. Push the knob to save the change.

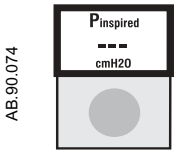


Note PSVPro is pressure supported ventilation with apnea backup.

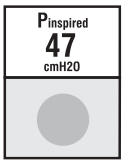
Step 3

Set the highlighted control parameter. Each mode has one parameter that must be set (VT for Volume and SIMV, Pinspired for Pressure, and Psupport for PSVPro).

- Turn, then push the knob to set the value.
- Until a value is set, the ventilator shows "---". If any other key is pressed at this time, a tone will sound.



AB.90.074



AB.90.075

Set ventilator controls

Optional features

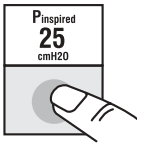
The Aestiva 7900 can be equipped with several optional ventilation functions. References made in this manual to SIMV and PSVPro modes, are only applicable to systems equipped with these functions.

The ventilator controls present are based on the ventilation mode.

Messages appear on the screen if:

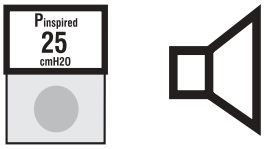
- You try to set a value the system cannot supply.
- You change a setting but do not save it: "Push knob to confirm change Turn knob to change setting".

Step 1
Push the selection key.



AB.90.076

Step 2
A tone sounds and a box flashes around the setting.



AB.90.077

Step 3
Turn the knob to set the value.

AB.90.078

Step 4
Push the knob to save the setting.

- A tone sounds.
- The flashing stops.

AB.90.079

Ventilator controls

Flow Trigger Level

This parameter sets the minimum flow detected by the ventilator which triggers the ventilator to deliver a mechanical breath to a spontaneously breathing patient. Only active in SIMV and PSVPro modes.

I:E This control sets the inspiratory to expiratory ratio of mechanical breaths supplied to the patient.

Insp. Termination Level This parameter sets the percentage of the peak inspiratory flow where the ventilator stops a pressure supported breath. Only active in SIMV and PSVPro modes.

PEEP This control sets the positive end expiratory pressure. This is only available during mechanical ventilation, but the control can be set at any time.

⚠ WARNING Do not use a separate mechanical PEEP valve; incorrect operation and patient injury can result.

Pinspired This control sets the amount of pressure delivered to the patient in each pressure controlled breath.

Plimit This control sets the maximum (and sustained) airway pressures tolerated in the patient's breathing system.

- If the high airway pressure limit is reached, inspiration stops and exhalation starts.
- The limit is an absolute value. There is no offset for PEEP pressure.

Note: Pmax is the peak sensed airway pressure; Plimit is the airway pressure limit set with front panel controls.

Psupport This control sets the delivered pressure during pressure support ventilation. Only active in SIMV and PSVPro modes.

Rate This control permits you to set the frequency of mechanical breaths delivered to the patient. It also establishes the apnea delay time in the PSVPro mode.

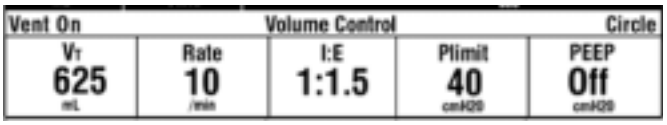
Tinspired This control sets the time in seconds for each timed inspiration. Only active in SIMV and PSVPro modes.

Trigger Window This control sets the range as a percent of the exhalation phase within which the patient may trigger the next mechanical breath. Only active in SIMV and PSVPro modes.

VT This control sets the tidal volume delivered to the patient in the Volume Control and SIMV modes.

Volume Control mode

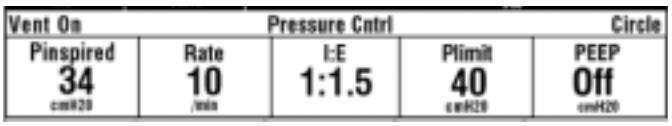
The figure and table below show Volume Control settings.



Settings	VT	Rate	I:E	Plimit	PEEP
Range	20 - 1500	4 - 100	2:1 - 1:8	12 - 100	Off, 4 - 30
Increments	varies*	1 bpm	0.5	1 cmH20	1 cmH20
*Increments of 1mL from 20 to 50, 5 mL from 50 to 100, 10 mL from 100 to 300, 25 mL from 300 to 1000, 50 mL from 1000 to 1500					

Pressure Control mode

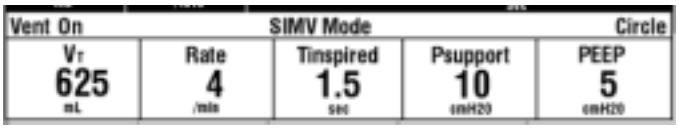
The figure and table below show Pressure Control settings.



Settings	Pinspired	Rate	I:E	Plimit	PEEP
Range	5 - 60	4 -1 00	2:1 - 1:8	12 - 100	Off, 4 - 30
Increments	1 cmH20	1 bpm	0.5	1 cmH20	1 cmH20

SIMV mode

The figure and table below show SIMV settings.



Settings	VT	Rate	Tinspired	Psupport	PEEP
Range	20 -1500	2 - 60	0.2 - 5.0	Off, 2-40	Off, 4 - 30
Increments	varies*	1 bpm	0.1 s	1 cmH20	1 cmH20
*Increments of 1mL from 20 to 50, 5 mL from 50 to 100, 10 mL from 100 to 300, 25 mL from 300 to 1000, 50 mL from 1000 to 1500					

PSVPro mode

PSVPro is pressure supported ventilation with apnea backup.

The figure below shows PSVPro settings. In this mode the Pinspired, Rate, and Tinspired parameters are not active, but they may be changed.

Vent On	PSVPro Mode			Circle
Pinspired 20 cmH20	Rate 10 /min	Tinspired 1.5 sec	Psupport 10 cmH20	PEEP 5 cmH20

During backup ventilation, the ventilator will ventilate the patient using the SIMV-PC + PSV mode. All parameters shown are active in this mode.

Vent On	SIMV-PC + PSV			Circle
Pinspired 20 cmH20	Rate 10 /min	Tinspired 1.5 sec	Psupport 10 cmH20	PEEP 5 cmH20

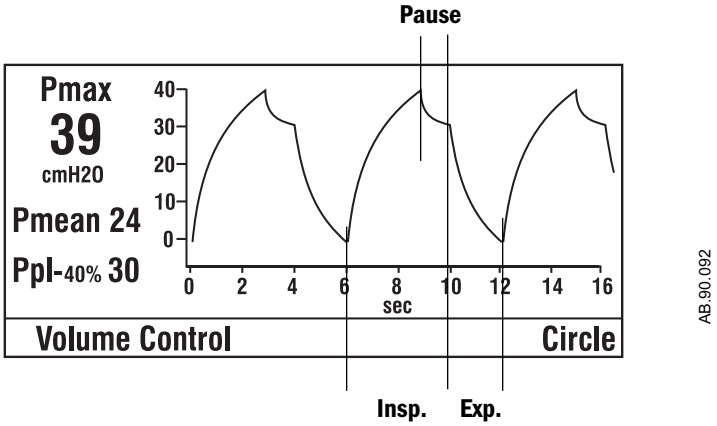
Settings	Pinspired	Rate	Tinspired	Psupport	PEEP
Range	5 - 60	2 - 60	0.2 - 5.0	Off, 2-40	Off, 4 - 30
Increments	1 cmH2O	1 bpm	0.1 s	1 cmH2O	1 cmH2O

Set inspiratory pause (volume modes)

You can only use inspiratory pause in Volume Control or SIMV modes. In pressure modes, Inspiratory Pause displays a message “No Pause ⚠”.

When Pause is on, the inspiratory volume stays in the patient’s lungs for the set pause time at the end of inspiration.

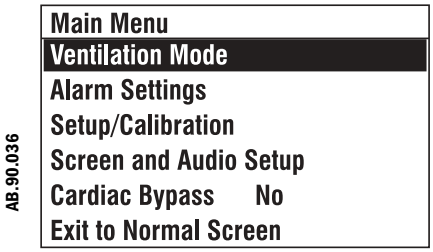
Pause can be set from Off to 60 percent of inspiratory time in increments of five percent. Minimum pause time is 400 ms.

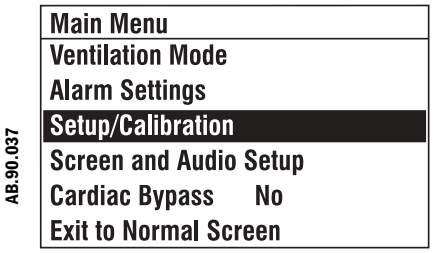


Step 1

Select the Setup/Calibration menu.

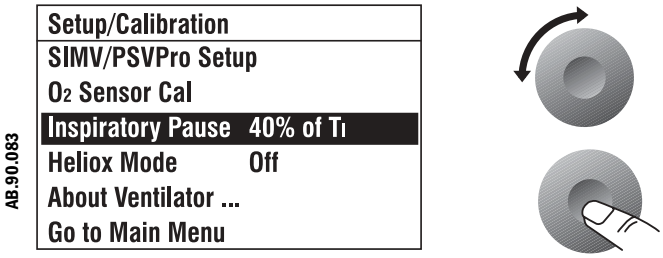
- Push the menu key.
- Turn, then push the knob to select the Setup/Calibration menu.





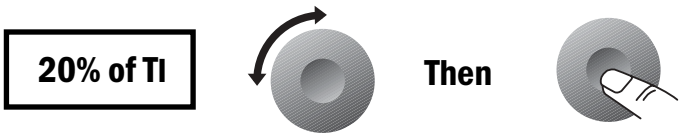
Step 2

Turn, then push the knob to select Inspiratory Pause.



Step 3

Turn, then push the knob to change the setting. You must push the knob to save the change.



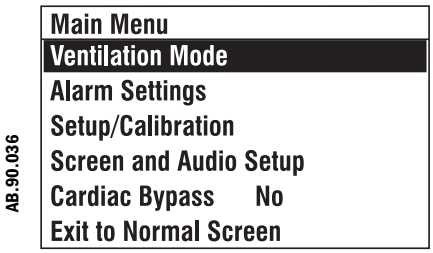
Set SIMV and PSVPro controls

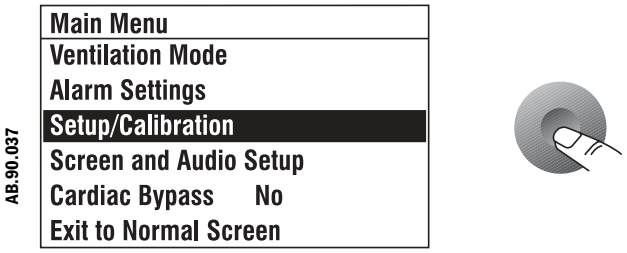
The SIMV and PSVPro modes allow the user to set additional ventilator controls. The Pinspired, Rate, Tinspired, Psupport and PEEP controls can be set using the selection keys. The Plimit, Trigger Window, Flow Trigger Level, and Inspiratory Termination Level may be set through the Setup/Calibration menu.

Step 1

Select the SIMV/PSVPro Setup menu.

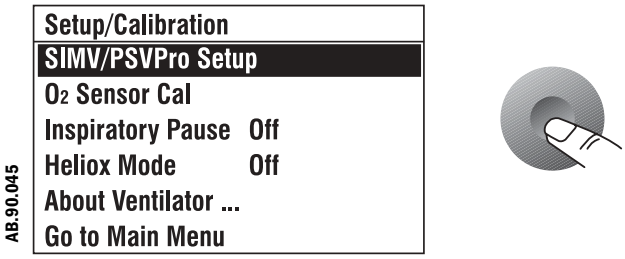
- Push the menu key.
- Turn, then push the knob to select Setup/Calibration.





Step 2

Push the knob to select SIMV/PSVPro Setup.



⚠WARNING Most anesthetic agents will cause patients to have reduced ventilatory responses to carbon dioxide and to hypoxemia. Therefore, triggered modes of ventilation may not produce adequate ventilation.

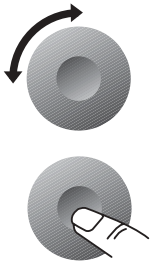
⚠WARNING The use of neuromuscular blocking agents will reduce the patient's breathing response, which will interfere with triggering.

Step 3

Turn, then push the knob to select a setting.

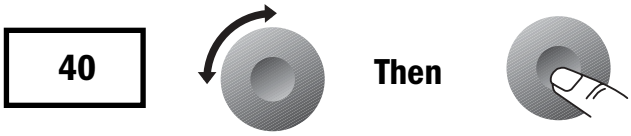
AB.90.073

SIMV/PSVPro Setup	
Plimit (cmH_20)	40
Trigger Window (%)	20
Flow Trigger Level (L/min)	1.0
Insp. Termination Level (%)	25
Backup Mode Active (sec)	25
Go to Setup/Calibration Menu	



Step 4

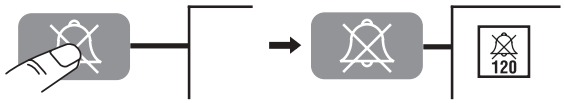
Turn, then push the knob to change the setting. You must push the knob to save the change.



Silence alarms

The alarm silence key silences current alarms for 120 seconds. When no alarm is active, holding down the alarm silence key for one second pre-silences low or medium priority alarms for 90 seconds. Minimum monitoring cannot be pre-silenced.

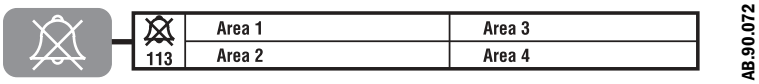
- The screen shows the time remaining in the silence period.
- Pushing the alarm silence key while an alarm is silenced will reset the countdown time to 120 seconds.
- High priority alarms always cause an audible tone and must be silenced individually.



Alarm tones identify the alarm priority:

- High Priority: 10 tones, 10 seconds pause, (repeat)....
- Medium Priority: 3 tones, 25 seconds pause, (repeat)....
- Low Priority: single tone.

Alarms appear at the top of the screen. The highest priority alarm will be shown in Area 1, the next highest priority alarm in area 2. If all areas are used, the lowest priority alarms cycle in area 4.



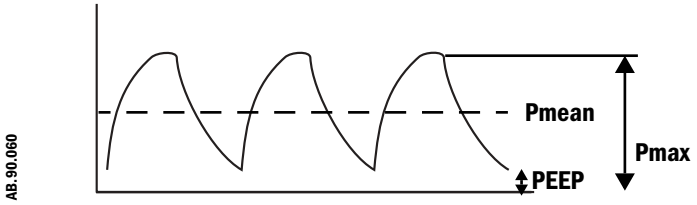
Note: Error mode messages may appear. Refer to 'Alarms and Troubleshooting' in Part 2 of the Operation Manual for more information.

- Minimum Monitoring: Monitoring data is available but a failure prevents mechanical ventilation.
- Minimum System Shutdown: Monitoring and ventilation are not possible.

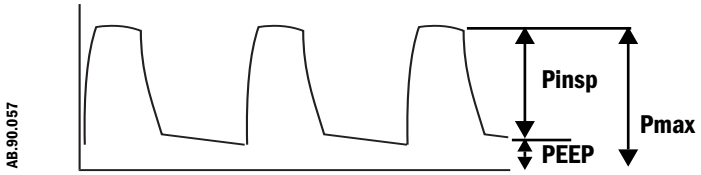
Reading the pressure waveform (Paw)

Different points on the waveform are instantaneous values for measured pressures. The horizontal axis indicates the time scale for the rate, I:E ratio, and inspiratory pause (volume control setting). The vertical axis indicates the pressure.

Volume Control Mode



Pressure Control Mode



Scales

The display automatically adjusts time and pressure scales to fit the control settings.

The time scale changes with the set Rate:

- 25 or less breaths per minute - time scale is 0 to 16 seconds
- 26 to 75 breaths per minutes - time scale is 0 to 8 seconds
- 76 or more breaths per minutes - time scale is 0 to 4 seconds
- On a change, existing pressure data is erased and new waveform data starts at time = 0.

The pressure scale changes with the Plimit setting:

- 12 to 40 Plimit, y-axis range is -5 to 40
- 41 to 60 Plimit, y-axis range is -5 to 60
- 61 to 100 Plimit, y-axis range is -5 to 100
- When the pressure scale changes, existing pressure data is erased and new waveform data starts at time = 0.

Example Volume Control

- PEEP: Off
- Maximum sensed inspiratory pressure (Pmax): 25
- Mean positive airway pressure (Pmean): 11

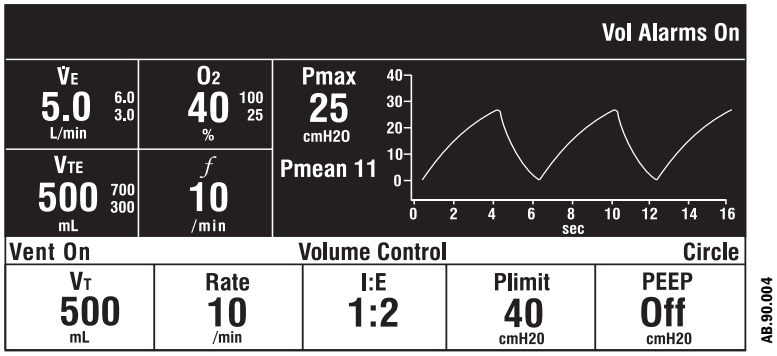


Figure 3-1 • Paw waveform in Volume Control mode

Example Pressure Control

- Pmax: 34
- Upper pressure limit (Plimit): 40
- PEEP: 10

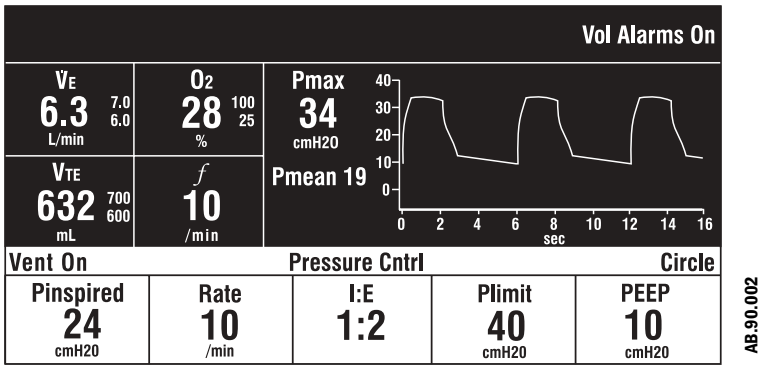


Figure 3-2 • Paw waveform in Pressure Control mode

Example SIMV

- Plateau pressure (Ppl): 15
- Inspiratory time (Tinspired): 1.5
- Inspiratory Pause: 60

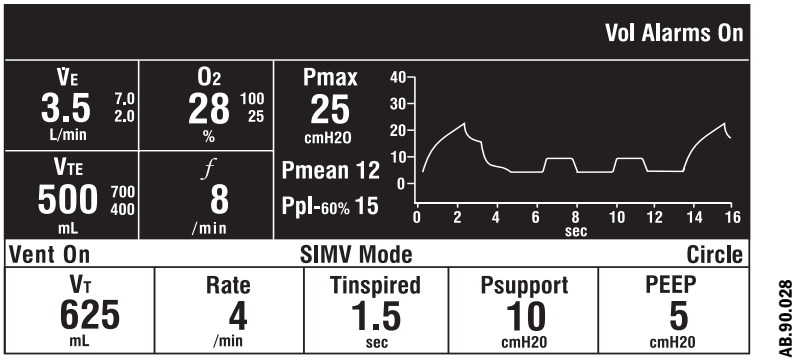


Figure 3-3 • Paw waveform in SIMV mode.

Example PSVPro

- PEEP: 5
- Pressure support: 10
- Mean positive airway pressure (Pmean): 7

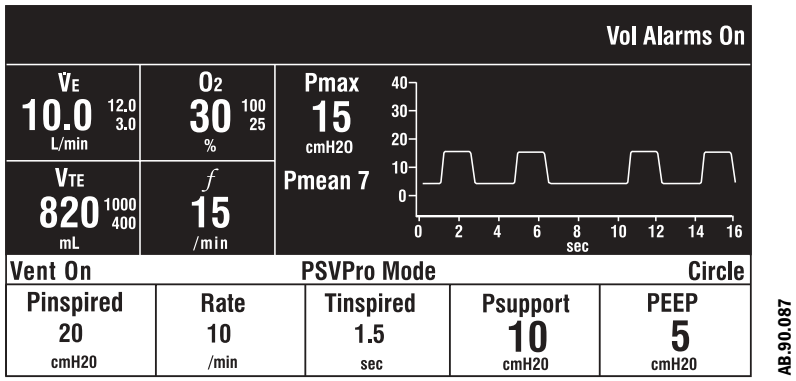


Figure 3-4 • Paw waveform in PSVPro mode.

Measure circuit compliance

To measure compressible volume in patient tubes:

1. Set the ventilator to volume control mode.
2. Set a tidal volume (V_T) of 500 mL
3. Set a rate of 10 breaths/min.
4. Set an I:E ratio of 1: 1
5. Set the Plimit control to 30 cmH_2O.
6. Occlude the patient connection of the Y piece. Do not contaminate a clean patient connection.
7. Turn on mechanical ventilation.
8. Monitor the exhaled tidal volume V_{TE} and P_{max} (measured peak airway pressure).

The V_{TE} measures the gas needed to fill the patient circuit at the measured pressure.

The example shows how tubing compliance factor can be calculated.

$V_{TE}/(P_{max} - 2.5^{1}\ cmH_2O)$ = Compliance factor in mL per cmH_2O

Example:

P_{max} = 21 cmH_2O

V_{TE} = 24 mL

$24/(21-2.5) = 1.3\ mL/cmH_2O$

This factor can be used to calculate the approximate gas compression in patient tubes.

For example, if the patient is requiring 30 cmH_2O to ventilate,
30 X 1.3 = 39 mL of gas is compressed in the tubes each breath. This gas (39 mL) is part of the set tidal volume but it does not reach the patient.

[1] Force of the Bellows.

Show the service settings

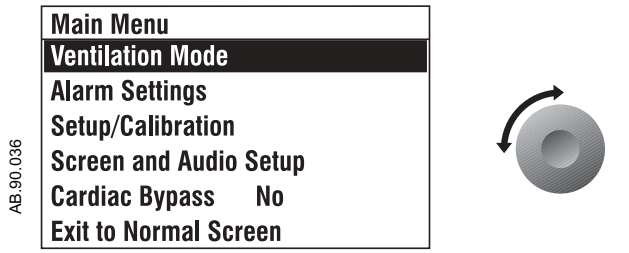
The About Ventilator screen shows ventilator settings that can only be changed by an approved service representative.

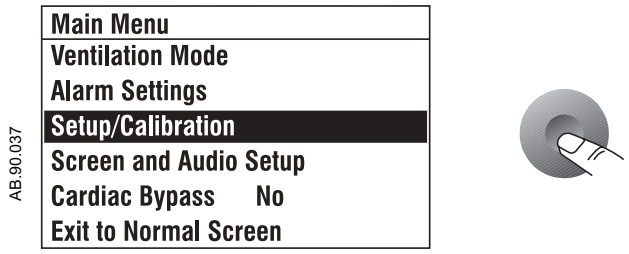
Item	Use
Software Version	If you call for service, a representative may ask for this.
Facility defaults or last settings	Tells you if the system saves the current settings when you turn it off or goes back to facility defaults.
Altitude	Used for gas calculations. If the altitude is not correct, O_2 calibration can fail.
Drive gas (O_2 or Air)	Tells you which gas the ventilator uses to drive the bellows. This gas comes from the same supply (pipeline or cylinder) that the anesthesia machine uses. If this gas comes from a cylinder, the cylinder empties faster than you would expect from the flowmeter settings.

Step 1

Select the Setup/Calibration menu.

- Push the menu key.
- Turn, then push the knob to select Setup/Calibration.

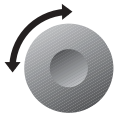




Step 2
Turn, then push the knob to select About Ventilator.

AB.90.045

Setup/Calibration	
SIMV/PSVPro Setup	
O_2 Sensor Cal	
Inspiratory Pause	Off
Heliox Mode	Off
About Ventilator ...	
Go to Main Menu	



AB.90.047

Setup/Calibration	
SIMV PSVPro Setup	
O_2 Sensor Cal	Start
Inspiratory Pause	20%
Heliox Mode	Off
About Ventilator ...	
Go to Main Menu	

AB.90.051

About Ventilator ...	
Software Version	4.0
Facility defaults used @ powerup	
Altitude	300 m
Drive Gas	O_2
Go to Setup/Calibration Menu	

Measure circuit compliance

To measure compressible volume in patient tubes:

1. Set the ventilator in volume control mode.
2. Set a tidal volume (V_T) of approximately 500 mL
3. Set a rate of 10 breaths/min.
4. Set an I:E ratio of 1:1.
5. Set the P_{limit} control to 20 cm H_2O.
6. Occlude the patient connection of the wye piece. Do not contaminate a clean patient connection.
7. Turn on mechanical ventilation.
8. Monitor the exhaled tidal volume V_{TE} and P_{max} (measured peak airway pressure).

The V_{TE} measures the gas needed to fill the patient circuit at the measured pressure.

The example shows how tubing compliance factor can be calculated.

$V_{TE}/(P_{max} - 2.5^1$ cm $H_2O)$ = Compliance factor in mL per cm H_2O

Example:

P_{max} = 20 cm H_2O

V_{TE} = 24 mL

24/(20–2.5) = 1.4 mL/cm H_2O

This factor can be used to calculate the approximate gas compression in patient tubes. For example, if the patient is requiring 30 cm H_2O to ventilate, 30 X 1.4 = 42 mL of gas is compressed in the tubes each breath. This gas (42 mL) is part of the displayed tidal volume but it does not reach the patient.

[1] Force of the bellows.

4 Preoperative Tests

In this section

Aespire 7900 Preoperative tests schedules 4-2
Inspect the System 4-4
Power failure alarm test 4-5
Minimize alarms (optional) 4-5
Pipeline and cylinder tests 4-6
Flow control tests 4-7
Vaporizer installation 4-9
Vaporizer back pressure test 4-10
Low-pressure leak test 4-11
Alarm tests 4-14
Breathing system tests 4-16
Monitor and ventilator tests 4-18

Aespire 7900 Preoperative tests schedules

Test Intervals

Do the Preoperative tests listed below at these events:

1. Every day before the first patient.
2. Before each patient.
3. When required after a maintenance or service procedure.

The following table indicates when a test must be done and gives a page number location where the test can be found.

Test intervals	Every day before the first patient	Before every patient
Inspect the system:	4-4	
Test the system:		
Power failure alarm test:	4-5	
Minimize alarms (optional):	4-5	
Pipeline and cylinder tests:	4-6	
Flow control tests:	4-7	
Vaporizer installation:	4-11	
Vaporizer back pressure test:	4-12	
Low-pressure leak test:		
Negative low-pressure leak test:	4-13	4-13
ISO 5358 or BSI standard positive low-pressure leak test:	4-15	4-15
Alarm tests:	4-16	
Breathing system tests:	4-18	4-18
Monitor and ventilator tests:	4-20	4-20

⚠WARNING Do not use this system unless you have read each component's operation and maintenance manual and understand:

- All system connections
- All of the warnings and cautions
- How to use each system component
- How to test each system component

Before you use this system:

- Complete all of the tests in this section
- Test all other system components

If a test failure occurs, do not use the equipment. Have an approved service representative repair the equipment.

Test devices

The following test tools are needed for some of the tests.

Item	Datex-Ohmeda Ref.
Positive pressure leak test device (BSI, 25 kPa)	1001-8975-000
Positive pressure leak test device (ISO 5358, 4 kPa)	1001-8976-000
Positive pressure leak test adapter	1009-3119-000
Negative pressure leak test device	0309-1319-800
Test lung	0219-7210-300
Stopper, test plug, red silicone, nominal 17 mm and 22 mm	2900-0001-000

Inspect the System

⚠WARNING Make sure that the breathing circuit is correctly connected and not damaged.

⚠WARNING The upper shelf weight limit is 34 kg (75 lb).

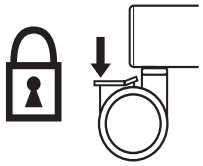
Make sure that:

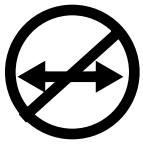
1. The equipment is not damaged.
2. All components are correctly attached.
3. The breathing circuit is correctly connected, not damaged, and the breathing system contains sufficient absorbent.
4. The vaporizers are locked in position and contain sufficient agent.
5. Pipeline gas supplies are connected and the pressures are correct.
6. Cylinder valves are closed on models with cylinder supplies.

⚠WARNING Do not leave gas cylinder valves open if the pipeline supply is in use. Cylinder supplies could be depleted, leaving an insufficient reserve supply in case of pipeline failure.

7. Models with cylinder supplies have a cylinder wrench attached to the system.
8. The necessary emergency equipment is available and in good condition.
9. Equipment for airway maintenance, tracheal intubation, and IV administration is available and in good condition.
10. Applicable anesthetic and emergency drugs are available.
11. If the optional O_2 flowmeter and suction regulator are present, the system O_2 and vacuum source must be connected and the system switch in the standby position:
    - The O_2 flowmeter provides adequate flow.
    - The suction regulator provides adequate suction.

12. Make sure the casters are not loose and the brake(s) is set and prevents movement.





13. Connect the power cord to a wall outlet. The mains indicator comes on when AC Power is connected.

- If the indicator is not on, the system does not have mains (electrical) power. Use a different outlet. Close the circuit breaker or replace or connect the power cable. Refer to Figure 2-2.

Power failure alarm test

1. Set the system switch to On.

2. Unplug the power cord with the system turned on.
3. Make sure that the power failure alarm (audio tone and “On Battery - Power OK?” message on the display) comes on.
4. Connect the power cord again.
5. Make sure the alarm cancels.
6. Set the system switch to Standby.

Minimize alarms (optional)

Set the ventilator controls to decrease the number of alarms:

1. Set the system switch to On.

2. Control Keys:
   - Volume alarms: Off.
3. Alarm menu:
   - Low O_2: 21%
   - High O_2: Off.
4. Bag/Vent switch:
   - Bag

5. Set the system switch to Standby.

Pipeline and cylinder tests

⚠CAUTION To prevent damage:

- Open the cylinder valves slowly.
- Do not force the flow controls.

If your system does not use cylinder supplies, do not do steps 2 through 12.

1. Disconnect the pipeline supplies and close all cylinder valves.
   If the pipeline and the cylinder pressure gauges are not at zero:
   - Connect an O_2 supply.
   - Set the system switch to On, if it is not already set.
   - Set the flow controls to mid range.
   - Make sure that all gauges but O_2 go to zero.
   - Disconnect the O_2 supply.
   - Make sure that the O_2 gauge goes to zero. As pressure decreases, alarms for low O_2 supply pressure should occur.

2. Make sure that the cylinders are full:
   - Open each cylinder valve.
   - Make sure that each cylinder has sufficient pressure. If not, close the applicable cylinder valve and install a full cylinder.
3. Test one cylinder at a time for high pressure leaks.
4. Set the system switch to Standby, which stops the O_2 flow.
5. Turn OFF the auxiliary O_2 flowmeter.
6. Turn off the suction.
7. Open the cylinder.
8. Record the cylinder pressure.
9. Close the cylinder valve.
10. Record the cylinder pressure after one minute. If the pressure decreases more than 690 kPa (100 psig) there is a leak.

- If there is a leak, install a new cylinder gasket and tighten the tee handle as shown in “How to install gas cylinders (high pressure leak test)” of the section ‘1 Setup and Connections’ in Part 2 of this manual.
- Do this step again. If the leak continues, do not use the system.

11. Repeat steps 7 through 10 for all cylinders.
12. Close cylinder valves.

⚠CAUTION Do not leave gas cylinder valves open if the pipeline supply is in use. Cylinder supplies could be depleted, leaving an insufficient reserve supply in case of pipeline failure.

13. Connect the pipeline supplies.
14. Set the system switch to On.

15. Use this chart to check pipeline pressure:

ANSI (USA and Intl.), Australian, Canadian, French, Japanese	345 kPa (50 psig)
ISO, Italian, South African, Spanish, Swiss	414 kPa (60 psig)
Austrian, German	500 kPa (75 psig)

16. Set the system switch to Standby.

Flow control tests

⚠WARNING The Link system cannot replace an O_2 monitor. Sufficient O_2 in the fresh gas may not prevent hypoxic mixtures in the breathing circuit.

- Nitrous oxide (N_2O), if available, flows through the system during this test. Use a safe and approved procedure to collect and remove it.
- Incorrect gas mixtures can cause patient injury. If the Link system does not supply O_2 and N_2O in the correct proportions, do not use the system.

Important Test the O_2 monitor as described in Alarm tests, step 8, before continuing.

To do the flow control tests:

1. Connect the pipeline supplies or slowly open the cylinder valves.
2. Turn all flow controls fully clockwise (minimum flow).
3. Set the system switch to On.

4. Do not use the system if low battery or other ventilator failure alarms occur.
5. Make sure the O_2 flowtube shows approximately .025 to .075 L/min. (0.200 L/min. for single-tube variants). The other flowtubes must show no gas flow.
   - Steps 6 and 7 are only for systems with N_2O.

⚠WARNING Keep the Link system engaged during steps 6 and 7:

- Adjust only the test control (N_2O in step 6 and O_2 in step 7).
- Test the flows in sequence (N_2O then O_2).
- The O_2 sensor used in steps 6 and 7 must be correctly calibrated.

6. Test the Link 25 system with flow increasing:
   - Turn the N_2O and O_2 flow controls fully clockwise (minimum flow).
   - Slowly turn the N_2O flow control counterclockwise.
   - Make sure that the O_2 flow increases. The measured O_2 concentration must be ≥21% through the full range.
7. Test the Link 25 system with flow decreasing:
   - Set the N_2O flow to 9.0 L/min.
   - Set the O_2 flow to 3 L/min or higher.
   - Slowly turn the O_2 flow control clockwise.
   - Make sure that the N_2O flow decreases. The measured O_2 concentration must be ≥21% through the full range.
8. Adjust the flow of all gases through their full range and make sure that the flowtube floats move smoothly.
9. Disconnect the O_2 pipeline supply or close the O_2 cylinder valve.
10. Make sure that:
    - The low O_2 supply alarm occurs.
    - N_2O, and O_2 flows stop. The O_2 flow stops last.
    - Air flow continues.

- Gas supply alarms occur on the ventilator if the ventilator uses O_2 as the drive gas.

11. Turn all the flow controls fully clockwise (minimum flow).
12. Reconnect the O_2 pipeline supplies or open the O_2 cylinder valve.
13. Set the system switch to Standby.

Vaporizer installation

⚠WARNING Use only the Selectatec series vaporizers Tec 4 or greater.

Do not use a vaporizer that lifts off the manifold when the lock lever is in the locked position.

Do not use this anesthesia system if you can turn ON more than one vaporizer at the same time.

Tec 6 Plus Vaporizers will not align correctly unless the power cable goes through the channel on the bottom of the vaporizer. Do not put the power cable on top of the manifold or between vaporizers.

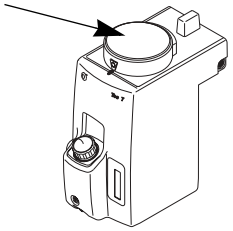
1. If the top of a vaporizer is not horizontal, remove the vaporizer and reinstall it.
2. Set each vaporizer lock lever to the locked position.
3. Try to lift each vaporizer straight up off the manifold rather than pulling forward. Do not rotate the vaporizer on the manifold.
4. If a vaporizer lifts off the manifold, install it again and complete steps 1, 2, and 3. If the vaporizer lifts off a second time, do not use the system.
5. With a Tec 6 Plus Vaporizer:
   - Make sure that the vaporizer is connected to an electrical outlet.
   - Hold down the alarm silence switch for a minimum of four seconds.
   - Make sure all indicators turn on and the alarm speaker starts.
   - Release the alarm silence switch.
   - Do not continue until the operational indicator turns on. The concentration control will not turn if the operational indicator is OFF.
6. Try to turn on more than one vaporizer at the same time:

- Test each possible combination.
- If more than one vaporizer turns on at the same time, remove the vaporizers, install them again, and complete steps 1 through 6.

Vaporizer back pressure test

⚠WARNING Anesthetic agent comes out of the common gas outlet during this test. Use a safe, approved procedure to remove and collect the agent.

⚠CAUTION To prevent damage, turn the flow controls fully clockwise (minimum flow or OFF) before you turn On the system.



1. Set the system switch to on. Alarms can occur.
2. Set the O_2 flow to 6 L/min.
3. Make sure that the O_2 flow stays constant and the float moves freely.

4. Adjust the vaporizer concentration from 0 to 1% one click at a time. The O_2 flow must not decrease more than 1 L/min through the full range. If the O_2 flow decreases more than 1 L/min:
   - If O_2 flow decreases more than 1 L/min, then install a different vaporizer and try this step again.
   - If the O_2 flow decreases less than 1 L/min with a different vaporizer, the malfunction is in the first vaporizer.
   - If the O_2 flow also decreases more than 1 L/min with a different vaporizer, the malfunction is in the anesthesia system. Do not use the system until it is serviced.
5. Complete steps 3 and 4 for each vaporizer.
6. Set the system switch to Standby.

Low-pressure leak test

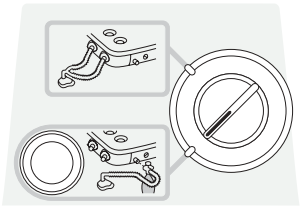
⚠WARNING Do not use a system with a low-pressure leak. Anesthetic gas will go into the atmosphere, not into the breathing circuit.

Perform either the Negative low-pressure leak test or the ISO 5358 or BSI standard positive low-pressure leak test. It is not necessary to perform both types of tests.

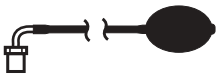
Negative low-pressure leak test

1. Set the System switch to Standby.

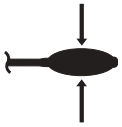
2. Turn on the auxiliary common gas outlet (switch in the ACGO position).



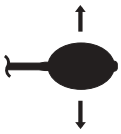
3. Test the negative pressure leak test device. (Ref. 0309-1319-800):



   - Remove all air from the bulb.



   - Put your hand on the inlet of the leak test device. Push hard for a good seal.
   - If the bulb inflates in less than 60 seconds, replace the leak test device.



4. Turn off all vaporizers.
5. Test the anesthesia machine for low-pressure leaks:
   - Turn the flow controls one and a half turns counterclockwise.
   - Connect the test device to the auxiliary gas outlet.
   - Compress and release the bulb until it is empty.
   - The vacuum causes the floats to move. This is usual. If the bulb inflates in 30 seconds or less, there is a leak in the low-pressure

circuit. Refer to the “Pneumatic problems” table in “Alarms and Troubleshooting” of Part 2 of this manual).

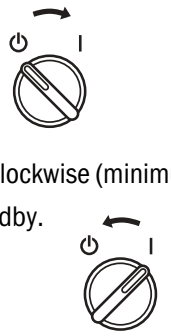
- Disconnect the test device.

6. Test each vaporizer for low-pressure leaks:
   - Set the vaporizer to 1%.
   - Repeat step 5. If there is a low pressure leak, refer to Part 2 of this manual.
7. Keep the test device with the system.
8. Turn all flow controls fully clockwise (minimum flow). Do not over tighten.

⚠WARNING Agent mixtures from the low-pressure leak test stay in the system. Always flush the system with O_2 after the low-pressure leak test (1 L/min for one minute).

⚠WARNING Turn off all vaporizers at the end of the low-pressure leak test.

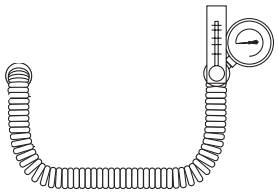
9. Flush the system with O_2:
   - Set the system switch to on.
   - Set the O_2 flow to 1 L/min.
   - Continue the O_2 flow for one minute.
   - Turn the O_2 flow control fully clockwise (minimum flow).
   - Set the system switch to Standby.



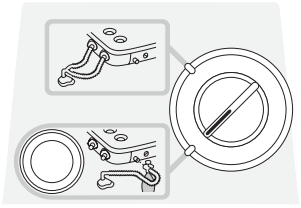
ISO 5358 or BSI standard positive low-pressure leak test

⚠CAUTION Do a positive pressure leak test at the ACGO port only.

1. Connect the leak test device to the ACGO port with the positive pressure leak test adapter.Push the adapter into the ACGO port throughout the test to get a good seal.
   - Test device ref:
     1001-8976-000 (4 kPa);
     1001-8975-000 (25 kPa);
     1009-3119-000 (Adapter).



2. Turn on the auxiliary common gas outlet (switch in the ACGO position).



3. Turn all controls fully clockwise (minimum flow).
4. Fully open the needle valve on the test device.
   - Keep the test device flow tube vertical for accurate results.

⚠CAUTION If the needle valve is not fully open, this test can damage the pressure gauge on the test device.

5. Open the O_2 flow control and set a total flow of 0.4 L/min through the flowmeter on the test device.
6. Make sure that the pressure gauge on the test device reads zero and that all other flow controls are fully closed.
7. Close the needle valve on the test device until the test gauge reads:
   - BSI: 20 kPa (2.9 psi)
   - ISO 5358: 3 kPa (0.4 psi)
8. If the flow through the test device is less than 0.35 L/min (ISO) or 0.3 L/min (BSI), there is a low pressure leak in the anesthesia machine. Refer to Part 2 of this manual.

9. Repeat this low-pressure leak test for each vaporizer:
   - Set the applicable vaporizer to 1% and do steps 2 through 8.
   - Fully open the needle valve on the test device to decrease the back pressure.
   - Turn the vaporizer off.

⚠WARNING Agent mixtures from the low-pressure leak test stay in the system. Always flush the system with O_2 after the low-pressure leak test (1 L/min for one minute).

Turn all vaporizers off at the end of the low-pressure leak test.

10. Remove the adapter and leak test device.
11. Flush the system with O_2:
    - Set the O_2 flow to 1 L/min and continue flow for one minute.
    - Turn the O_2 flow control fully clockwise (minimum flow).
    - Set the system switch to Standby.

Alarm tests

1. Connect a test lung to the patient connection.
   Test device ref. 0219-7210-300.
2. Set the Bag/Vent switch to Vent.
3. Set the system to On.

4. Set the controls:

Ventilation Mode:	Volume control (Select from main menu)
Ventilator:	Tidal Vol: 400 ml Rate: 12 I:E Ratio: 1:2 P_{limit}: 40 cm H_2O PEEP: Off
Anesthesia Machine:	O_2 flow: minimum flow (25-75 mL/min) (about 200 mL for single-tube variant) All other gases: OFF Push flush to fill the bellows.

5. Turn the Bag/Vent switch to Bag and back. Make sure that:
   - Mechanical ventilation starts.
   - A subatmospheric pressure alarm does not occur.
   - The ventilator displays the correct data.
   - The bellows inflate and deflate during mechanical ventilation.
6. Set the O_2 flow control to 5 L/min.
7. Make sure that:
   - The end expiratory pressure is approximately 0 cm H_2O.
   - The ventilator displays the correct data.
   - The bellows inflate and deflate during mechanical ventilation.
8. Test the O_2 monitor and alarms:
   - Remove the O_2 sensor and make sure the sensor measures approximately 21% O_2 in room air.
   - Set the low O_2 alarm to 50% and make sure a low O_2 alarm occurs.
   - Set the low O_2 alarm back to 21% and make sure that alarm cancels.
   - Put the O_2 sensor back in the circuit.
   - Set the High O_2 alarm to 50%.
   - Push the flush button to fill the breathing system.
   - Make sure the high O_2 alarm comes on.
   - Set the high O_2 alarm back to 100% and make sure that alarm cancels.
   - After 2 minutes in pure O_2, make sure that the sensor measures approximately 100% O_2.
9. Test the low minute volume alarm:
   - Go to the alarms menu.
   - Set the alarm limit for low minute volume to 6.0 L/min.
   - Make sure that a low minute volume alarm occurs.
   - Go to the alarms menu.
   - Set the low minute volume alarm to Off.
10. Test the high airway pressure alarm:
    - Set P_{limit} to less than the peak airway pressure.
    - Make sure that the high airway pressure alarm occurs.
    - Set P_{limit} back to 40.
11. Test the apnea and low airway pressure alarms:
    - Remove the test lung from the patient connection.
    - Other alarms such as low minute volume can occur.
    - Make sure that the low airway pressure and apnea alarms occur. The apnea alarm occurs after 30 seconds.
12. Test the sustained airway pressure alarm:

- Set the controls:

APL Valve:	70
Bag/Vent switch:	Bag

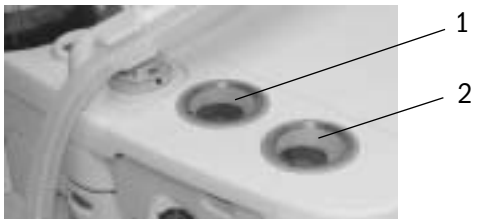
- Mechanical ventilation stops when the Bag/Vent switch is set to Bag.
- Close the patient connection and push the O_2 Flush button.
- Make sure that the sustained pressure alarm occurs after approximately 15 seconds at the sustained pressure limit (6-30 cm H_2O varies with pressure limit).

13. Set the system to Standby.

Breathing system tests

Refer to the applicable operation manuals. At a minimum:

1. Make sure that the auxiliary equipment (humidifier, etc.) operates correctly.
2. Make sure that the check valves on the breathing circuit module work correctly:
   - The Expiratory check valve (1) rises during expiration and falls at the start of inspiration.
   - The Inspiratory check valve (2) rises during inspiration and falls at the start of expiration.



⚠WARNING Objects in the breathing system can stop gas flow to the patient. This can cause injury or death:

Do not use a test plug that is small enough to fall into the breathing system.

3. Ventilator bellows test:
   - Set the system switch to Standby.
   - Set the Bag/Vent switch to Ventilator.
   - Set all flow controls to minimum.
   - Close the breathing circuit at the patient connection. Use your hand or the test plug.
   - Push the O_2 flush button to fill the bellows.
   - The pressure must not increase to more than 15 cm H_2O on the pressure gauge.
   - If the bellows falls lower than the top of the indicator, it has a leak. On a single-tube variant, the bellows should not fall at all. Refer to the troubleshooting procedure in the Part 2 of this manual.

4. Test the Bag circuit for leaks:
   - Set the system switch to On.
   - Set the Bag/Ventilator switch to Bag.
   - Plug the Bag port; use your hand or the approved test plug.
   - Close the APL valve (70 cm H_2O).
   - Set the O_2 flow to 250 mL/min.
   - Close the patient connection using a hand or test plug on the breathing system and pressurize the bag with the O_2 flush button to approximately 30 cm H_2O.
   - Release the flush button. The pressure must not decrease. A pressure decrease large enough to see on the gauge indicates a leak. Look for and repair the breathing circuit leak.
5. Test the APL valve:
   - Fully close the APL valve (70 cm H_2O).
   - Set the total fresh gas flow to approximately 3 L/min and make sure that the value on the inspiratory pressure gauge does not exceed 85 cm H_2O. Some pressure fluctuation is normal.
   - Fully open the APL valve (to the MIN position).
   - Set O_2 flow to 3 L/min. Turn any other gases off.

- Make sure that the value on the inspiratory pressure gauge is less than approximately 5 cm H_2O.
- Push the O_2 flush button. Make sure that the value on the inspiratory pressure gauge stays near zero.
- Set the O_2 flow to minimum and make sure that the value on the inspiratory pressure gauge does not decrease below 0 cm H_2O.

6. Remove your hand or the test plug from the patient connection.
7. Set the System switch to Standby.

⚠WARNING Make sure that there are no test plugs or other objects caught in the breathing system.

Monitor and ventilator tests

1. Connect a test lung to the patient connection.
2. Set the Bag/Ventilator switch to Bag.
3. Set the System switch to On.
4. Set the controls:

Ventilation Mode:	Volume control (Select from main menu)
Ventilator:	Tidal Vol: 400 ml Rate: 12 I:E Ratio: 1:2 P_{limit}: 40 cm H_2O PEEP: Off
Anesthesia Machine:	O_2 flow: minimum flow) All other gases: OFF

5. Set the Bag/Vent switch to Ventilator.
6. Push the O_2 flush button to fill the bellows.
7. Make sure that:
   - Mechanical ventilation starts.
   - A subatmospheric pressure alarm does not occur.
     Note: With active gas scavenging, too much scavenging flow can cause subatmospheric alarms.
   - The ventilator displays the correct data.
   - The bellows inflate and deflate during mechanical ventilation.
8. Set the O_2 flow control to 5 L/min.
9. Make sure that:
   - The end expiratory pressure is approximately 0 cm H_2O.
     Note: Positive end expiratory pressure when PEEP is off may indicate that the scavenging system is not removing enough gas.

- The ventilator displays the correct data.
- The bellows inflate and deflate during mechanical ventilation.

10. Set the ventilator controls and alarm limits to clinically appropriate levels.
11. If the system will not be used immediately, set the System switch to Standby and close all cylinder valves.
12. Make sure that you have:

Equipment for:	Airway maintenance
	Manual ventilation
	Tracheal intubation
	IV administration
Applicable anesthetic and emergency drugs	

13. Prepare the system:
    - Turn all vaporizers off.
    - Open the APL valve.
    - Set the Bag/Ventilator switch to Bag.
    - Set all flow controls to minimum.
    - Set sufficient patient suction.
    - Make sure that the breathing system is correctly connected and not damaged.

⚠WARNING Make sure that the breathing circuit is correctly connected and not damaged.

⚠WARNING Before you connect a patient, flush the anesthesia machine with 5 L/min of O_2 for at least one minute. This removes unwanted mixtures and by-products from the system.

- End of Part 1 of the User's Reference Manual. -

Index

A

ACGO 2-8
AGSS 2-10
antistatic breathing tubes or masks 2-2
APL valve 2-7
Auxiliary Common Gas Outlet switch 2-6
adequate ventilation 3-25
alarm priority 3-16

B

backup ventilation 3-22
Bag / Mechanical Ventilation switch 2-8

C

compressible volume 3-31, 3-34

E

Expiratory check valve 4-16

G

gas compression in patient tubes 3-34

I

Inspiratory check valve 4-16

L

leak test device 4-11
Link system 4-7

M

Mapleson series 2-9
menu functions 2-17
menu map 2-16
MRI environment 1-2

N

neuromuscular blocking agents 3-25
nuisance alarms 3-11

O

optional ventilation functions 2-12, 3-19

P

pipeline pressure 4-7
Pressure Control mode 3-21
Pressure controlled modes 3-17
PSVPro mode 3-21

S

SIMV mode 3-21

T

tubing compliance factor 3-31

V

Volume controlled modes 3-17

Warranty

This Product is sold by Datex-Ohmeda under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this Product directly from Datex-Ohmeda or Datex-Ohmeda's Authorized Dealers as new merchandise and are extended to the Buyer thereof, other than for the purpose of resale.

For a period of twelve (12) months from the date of original delivery to Buyer or to Buyer's order, but in no event for a period of more than two years from the date of original delivery by Datex-Ohmeda to a Datex-Ohmeda Authorized Dealer, this Product, other than its expendable parts, is warranted against functional defects in materials and workmanship and to conform to the description of the Product contained in this User's Reference manual and accompanying labels and/or inserts, provided that the same is properly operated under the conditions of normal use, that regular periodic maintenance and service is performed and that replacements and repairs are made in accordance with the instructions provided. This same warranty is made for a period of thirty (30) days with respect to expendable parts. The foregoing warranties shall not apply if the Product has been repaired other than by Datex-Ohmeda or in accordance with written instructions provided by Datex-Ohmeda, or altered by anyone other than Datex-Ohmeda, or if the Product has been subject to abuse, misuse, negligence, or accident.

Datex-Ohmeda's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at Datex-Ohmeda's option, a Product, which is telephonically reported to the nearest Datex-Ohmeda Customer Service Center and which, if so advised by Datex-Ohmeda, is thereafter returned with a statement of the observed deficiency, not later than seven (7) days after the expiration date of the applicable warranty, to the Datex-Ohmeda Customer Service and Distribution Center during normal business hours, transportation charges prepaid, and which, upon Datex-Ohmeda's examination, is found not to conform with above warranties. Datex-Ohmeda *shall not be otherwise liable for any damages including but not limited to incidental damages, consequential damages, or special damages.*

There are no express or implied warranties which extend beyond the warranties hereinabove set forth. Datex-Ohmeda makes no warranty of merchantability or fitness for a particular purpose with respect to the product or parts thereof.

Aespire 7900
User's Reference Manual, English Part 1
1009 0632 000
10 04 A 01 21 03
Printed in USA
©Datex-Ohmeda, Inc. All rights reserved